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APPLIED ARITHMETIC
THE THREE ESSENTIALS

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APPLIED ARITHMETIC
THE THREE ESSENTIALS

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BOOK I

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PREFACE

THIS book is the first of a three-book series, and is intended to cover the work in Arithmetic of the second, third, and fourth grades. The principles which have guided the authors may be grouped under three main heads:

1. *Selection and Organization of Subject Matter.* Recent discussion and practice, as revealed in the literature and in published curricula, seem to show substantial agreement as to what topics should be included in the earlier part of a course in Arithmetic, while there is yet considerable difference of opinion as to topics to be included in the later parts. All topics whose inclusion or exclusion is now being debated are placed among the supplementary topics at the end of Books II and III. The main body of each book furnishes a minimum course, which may be studied without break in continuity. At points noted in the text supplementary topics may be taken up. It is believed that in this respect these books will serve each of many different needs just as effectively as if they were prepared to meet each need exclusively. The business of the maker of text books is to furnish teachers and supervising officers effective instruments for carrying out their purposes, rather than to seek to impose rigidly his own personal predilections or whims.

It has been the purpose of the authors to arrange the subject matter in such a manner that the greatest simplicity of treatment may be attained. In the first book this is exemplified by the relating of the fundamental combinations, as shown on pages 17, 31, 34 for the addition and subtraction combinations, and on pages 20, 29, 36, 48, 56, 98, 100, 101, 133 for the multiplication and division combinations. In order to simplify the development, effort has been made to break up larger difficulties into smaller constituent difficulties. On this point see the development of addition, pages 72 to 86; the development of subtraction, pages 92 and 113 to 117; the development of multiplication, pages 126 and 148 to 152; and the development of long division, pages 231 to 239, and 252 and 253.

In the later books this unifying and simplifying of the subject matter has been carried out in many ways.

2. *Derivation and Application.* It is commonplace to remark that the elementary facts of Arithmetic should be derived from the child's own experiences. But practice has not been in uniform accord with this commonplace. Too frequently use has been made of material that actually comes within the experience of a comparatively small number of children. Thus, manual training may furnish most excellent sources for number work, *provided* the child has had experience with just that kind of manual training; otherwise it is very bad material. The authors believe that in these books the elementary facts of Arithmetic are derived from situations which are within the range of experience of nearly all normal children. Not infrequently books have been based on work done in some one very excellent school or system of schools, where the children have been subjected to special experiences, such as construction work. When such books are placed in the hands of children not subjected to these particular experiences, the result is disastrous.

The applications of Arithmetic should likewise be made to things of *general* child interest. The most effective applications of Arithmetic can be made only when considerable local material is brought in. Such material is most effective when brought in by the child itself. For these reasons there are throughout these books many suggestions for the making of problems by the children. On this point see the pages referred to in the index under the heading, "Making New Problems."

3. *Motivation.* The subject matter of Arithmetic can be motivated most effectively only when the freest possible use is made of the child's many spontaneous interests. The authors have not neglected any opportunity that has occurred to them to interest the child in the subject matter itself and its manifold applications. They have recognized, however, that it is possible so to connect the learning of Arithmetic with other activities which in themselves are of compelling interest to the child, that the combination will be a source of joy and life when the Arithmetic elements alone would lead to sadness and forced labor. For this reason systematic use has been made of games of group competition and many simpler games. On this point see the pages referred to in the index under the heads, "Games used in drills in Addition," "Games used in drills in Subtraction," and so on.

Some other points may be mentioned. The best existing information on the relative difficulties that children have in learning and retaining the various fundamental combinations has been made use of, and the more difficult combinations have been repeated more frequently in drills and reviews. Moreover, each child is encouraged to make lists of combinations of exceptional difficulty, and to study them separately. See pages referred to in the index under the title, "Difficult Combinations."

The formal setting out of each new number fact as it is first learned should help to create definite responsibility on the part of the child for the important things he is to learn.

No effort has been spared to make the books attracti appearance and convenient in the arrangement of sub matter on the page.

The reason for producing this series lies in the belief t by careful and systematic use of all that is best in pres knowledge and usage it should be possible to produce a se of texts that would more adequately meet the requireme of the modern school than any now in existence.

These books have been built leisurely. The first dr was made nearly ten years ago. During the interveni time the work of selecting what has proved most certain valuable, both in what is old and what is new, and in orga izing and relating the various parts, has been in consta progress. It is difficult, if not impossible, to make prope acknowledgment to all who have helped in this work. Th most prominent among these, however, have been Dr Theodore Lindquist, Head of the Department of Mathematics in the State Normal School at Emporia, Kansas, and Mr. H. C. Pearson, Principal of the Horace Mann School in the City of New York, and several of his corps of teachers.

THE AUTHORS.

CONTENTS

CHAPTER I

PAGE

Counting 1
Numbers to 5 .... 2, 3
Numbers to 6 .... 4, 5
Drills and Applications 6, 7
Numbers to 7 and Applications 8, 9
Numbers to 8 and Drill 10, 11
Numbers to 10, Drill, Applications 12–15
Making Change, Subtraction 16, 17
Counting by 2's. Table of 2's 18
A Number Game 19
Counting by 3's. Table of 3's 20
Applications 21
Numbers to 11, Drill 22, 23
Numbers to 12 24
Number Games 25, 26
Measuring, Inch, Foot 27
One-half of a Number 28
One-fourth, One-third 29
Parts of 12 30
Drill 31, 32
Decimal Number System 33
The Number 13 34
Table of 2's 35
Drill 36
Numbers to 14 37
Reading and Writing Numbers 38, 39
Table of 5's 40, 41
U. S. Money 42
Applications 43, 44
Drills 45
Estimating and Measuring Distances 46, 47
Drills 48
Applications, Dozen 49, 50
Number System 51

PAGE
PARTS OF NUMBERS........ 52, 53
DRILL........ 54
APPLICATIONS........ 55
TABLE OF 4'S........ 56
LIQUID MEASURE........ 57
DRILLS........ 58, 59
DAYS OF WEEK........ 60
TABLE OF 3'S........ 61
TELLING TIME, ROMAN NUMERALS........ 62, 63
APPLICATIONS........ 64
DRILL........ 65
APPLICATIONS........ 66, 67
TIMES........ 68
DRILLS, TABLES........ 69, 70

CHAPTER II

NUMBER GAME........ 71
ADDING BY ENDINGS........ 72–76
ADDITION........ 77, 78
SAVING MONEY........ 79
ADDITION, CARRYING........ 80, 81
DECIMAL NUMBER SYSTEM........ 82, 83
ADDITIONS........ 84, 85
ADDING DOLLARS AND CENTS........ 86
SAVING MONEY........ 87
APPLICATIONS........ 88
DRILLS........ 89, 90
NUMBER GAME........ 91
SUBTRACTIONS........ 92
APPLICATIONS........ 93
DRILLS........ 94
APPLICATIONS........ 95, 96, 97
TABLE OF 2'S........ 98
TABLE OF 3'S........ 99
DRILL........ 100
TABLE OF 4'S........ 101
TABLE OF 5'S........ 102
NUMBER GAME........ 103
LIQUID MEASURE........ 104, 105
APPLICATIONS........ 106, 107

PAGE
ADDITION.......... 108, 109
READING AND WRITING NUMBERS.......... 110
USES OF LARGE NUMBERS.......... 111
MAKING CHANGE.......... 112
SUBTRACTION.......... 113–117
APPLICATIONS.......... 118, 119
DRAWING TO SCALE.......... 120, 121
TABLE OF 6'S.......... 122, 123
DRILL.......... 124
APPLICATIONS.......... 125

CHAPTER III

MULTIPLICATION.......... 126, 127
APPLICATIONS.......... 128, 129
TABLE OF 7'S.......... 130
APPLICATIONS.......... 131
DRILL EXERCISES.......... 132
NUMBER FACTS RELATED TO TABLES.......... 133
DRILL EXERCISES.......... 134, 135
TABLE OF 8'S.......... 136
DRILL EXERCISES.......... 137
DRY MEASURE.......... 138, 139
APPLICATIONS.......... 140–143
TABLE OF 9'S.......... 144, 145
MULTIPLICATION.......... 146–149
TABLE OF 10'S.......... 150
MULTIPLICATION.......... 151, 152
DRILL EXERCISES.......... 153
APPLICATIONS.......... 154, 155
MULTIPLICATION.......... 156
TABLES, QUOTIENTS.......... 157
POUNDS, OUNCES.......... 158, 159
DRILL EXERCISES.......... 160, 161
TIME.......... 162, 163
QUOTIENTS, REMAINDERS.......... 164, 165
TIME.......... 166, 167
APPLICATIONS.......... 168, 169
DOZEN.......... 170
DRILL EXERCISES.......... 171–173
SHORT DIVISION.......... 174, 175

PAGE
PROBLEMS WITHOUT NUMBERS 176, 177
POSTAGE 178
APPLICATIONS 179, 180
DRILL EXERCISES AND REVIEW 181, 182

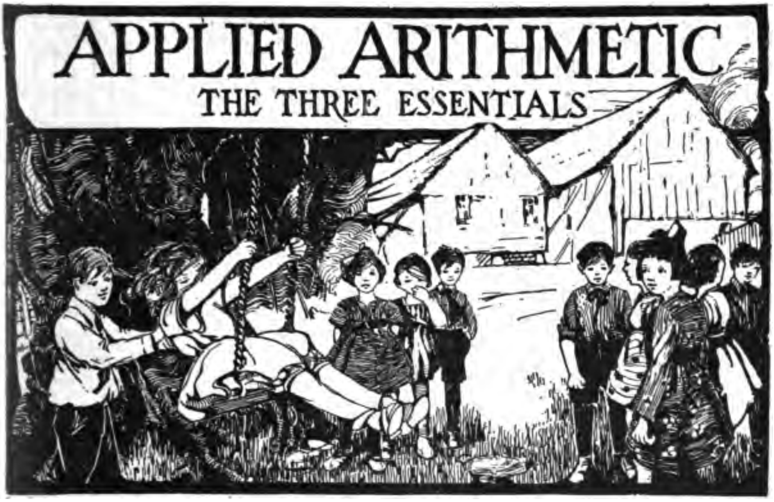
CHAPTER IV

READING AND WRITING NUMBERS 183, 184
ROMAN NUMERALS 185
ADDITION 186–188
BILLS 189
APPLICATIONS 190, 191
SUBTRACTION 192
ADDITION AND SUBTRACTION 193
MULTIPLICATION 194
A NUMBER GAME 195
BILLS 196
MULTIPLICATION 197
APPLICATIONS 198
TIME 200, 201
APPLICATIONS 202, 203
DRAWING TO SCALE 204, 205
DRILL EXERCISES 206
APPLICATIONS 207
FRACTIONS 208, 209
DRILL EXERCISES 210
SHORT DIVISION 211, 213
AVERAGES 214
PROBLEMS WITH NUMBERS 215
APPLICATIONS 216, 217
DRILL EXERCISES 218, 219
APPLICATIONS 220
AREAS 221
APPLICATIONS 222–226

CHAPTER V

READING NUMBERS 227
DRILL EXERCISES 228
TABLES OF 11'S AND 12'S 229, 230
LONG DIVISION 231–239
SPEEDS AND DISTANCES 240, 241
MEASURING LAND 242–245

PAGE
PROBLEMS WITHOUT NUMBERS........ 246
CUBIC CONTENTS........ 247–249
APPLICATIONS........ 250, 251
LONG DIVISION........ 252, 253
APPLICATIONS........ 254–258
FRACTIONS........ 259–263
APPLICATIONS........ 264
PROBLEMS WITHOUT NUMBERS........ 265
COST OF USING MAILS........ 266
DRILL EXERCISES........ 267
APPLICATIONS........ 268–276
PROBLEMS WITHOUT NUMBERS........ 277
APPLICATIONS........ 278
TABLES........ 279, 280



CHAPTER I

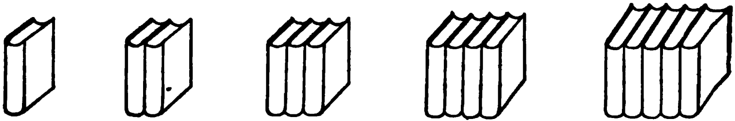
COUNTING

1. How many children are there in the picture?

   How do you find out how many there are?
2. How many boys are there in the picture?
3. How many girls are there in the picture?
4. How many children are there in each group?
5. Two boys and one boy are how many boys?
6. Three girls and one girl are how many girls?
7. Each child swings twenty times. Count for one child to swing.
8. If you have a swing at home, play as these children are playing.

See page 289.

Count the books in each group.



Write the figures which mean *one*, *two*, *three*, *four*, *five*. Read the next two lines:

● ● ●● ●● ● ●●● ●● ●● ●●●●

1 and 1 are 2 2 and 1 are 3 2 and 2 are 4.

●●● ● ●●
●● ●●
●● ● ●●
●●● ●● ●●● ●●
●●●

3 and 1 are 4 4 and 1 are 5 2 and 3 are 5.

The sign + means **and** or **plus**.
The sign = means **are, is, equal,** or **equals.**

"3 and 2 are 5" is written "3+2=5"

The signs are used because they are shorter and easier to write than the words.

Read:

1+3=4, 2+2=4, 3+1=4, 4+1=5, 3+2=5.

New Number Facts

1+1=2 2+2=4 4+1=5
2+1=3 3+1=4 3+2=5

To **add** 2 dots and 3 dots we take them together to make 5 dots. The 5 dots are the **sum** of the 2 dots and the 3 dots.

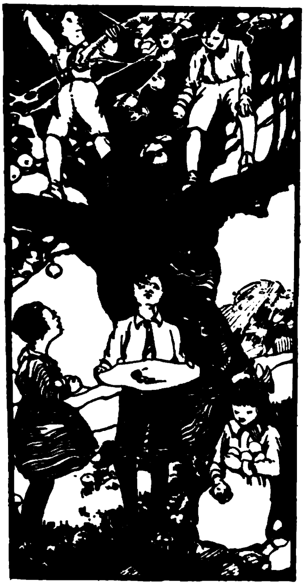
In 3+2=5, the numbers 3 and 2 are added. The sum is 5.

See page 289.

ORAL EXERCISES

What are these children doing?

1. How many boys are there in the picture?



2. How many children are there in the picture?

3. How many girls are there in the picture?

4. Two children and one child are how many children?

5. Three children and two children are how many children?

6. Mary has three apples. John gives her one more. How many has she then?

7. John has four apples and eats one of them. How many has he left?

8. Mary says: "Jennie has four apples and picks up one more. Then she has apples."

9. Jennie tells this story: "John throws two apples to Mary and two to Harry. In all he throws apples."

10. John tells this story: "Tom has two apples and picks up three more. Then he has apples."

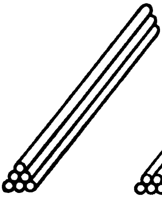
11. Henry tells this story: "Mary has five apples and gives three to her brother. Then she has apples."

12. Tell some more number stories about apples. See who can tell the best story.

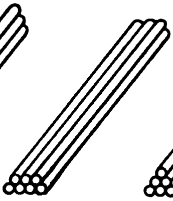
See page 290.

ORAL AND WRITTEN EXERCISES

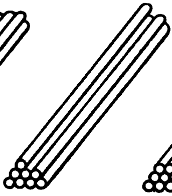
1. Count the splints in each bundle.



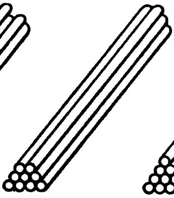
6 splints



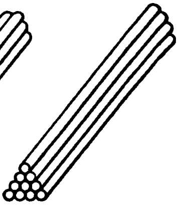
7 splints



8 splints

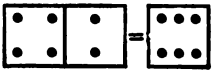


9 splints

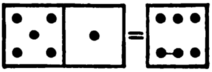


10 splints

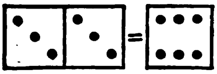
2. Write the figures which mean *six*, *seven*, *eight*, *nine*, and *ten*. Make the figures large and clear.



4+2=6



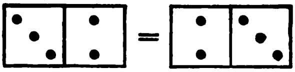
5+1=6



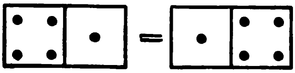
3+3=6

3. Read the line above.

4. Is 3+2 equal to 2+3?
Is 3+1 equal to 1+3?



5. Is 4+1 equal to 1+4?
Is 5+1 equal to 1+5?



6. Make cards to show 2+1, 1+2, 2+2, 3+1, 1+3.

When numbers are to be added they are usually written one above the other to form a column. The sum is then placed below a line drawn under the column.

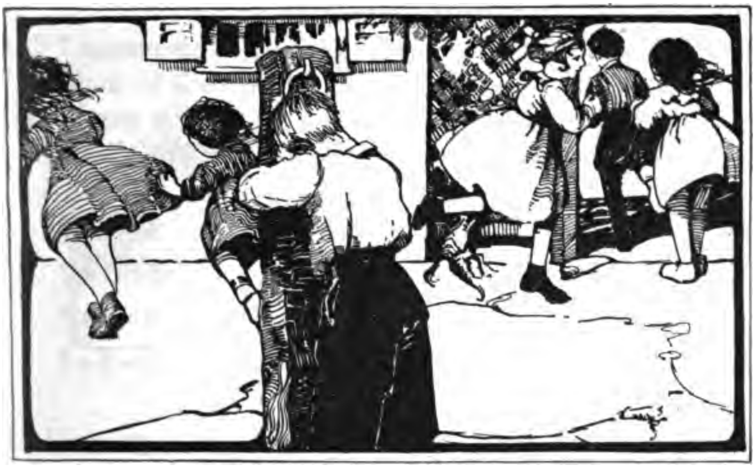
$$\boxed{\begin{array}{c}2\\3\\\hline 5\end{array}}$$

Read and give sums rapidly:

7.	2	1	3	1	2	4	1
	1	2	1	3	2	1	4
	—	—	—	—	—	—	—
8.	4	2	3	2	3	5	1
	2	4	2	3	3	1	5
	—	—	—	—	—	—	—

New Number Facts
4+2=6
5+1=6
3+3=6

See page 290.



ORAL EXERCISES

What are these children doing?

1. How many children are running to hide?
2. Five children and one child are how many children?
3. How many children are running around the right end of the house?
4. Four children and two children are how many children?
5. Three children and three children are how many children?
6. Three children and two children are how many children?
7. The child that is blind-folded is counting. Count as far as you can.
8. Tell some number stories about children playing hide-and-seek.

Use these sums in your stories:

1+3, 1+4, 2+2, 5+1, 4+2, 2+3, 3+3

See page 291.

ORAL EXERCISES

1. Find the missing number in $5=3+?$ This means "find the number which must be added to 3 to make 5." The question mark stands for the missing number.

Read the example this way: "5 equals 3 plus 2."

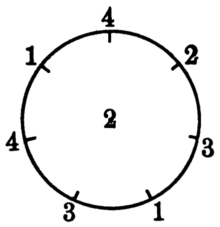
Read and supply the missing numbers:

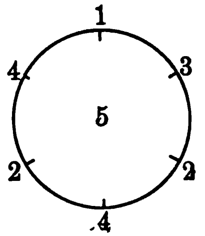
2. $3=2+?$ $3=1+?$ $4=3+?$ $4=1+?$
3. $5=4+?$ $5=1+?$ $5=3+?$ $5=2+?$
4. $6=5+?$ $6=1+?$ $6=4+?$ $6=2+?$
5. $2=1+?$ $4=2+?$ $6=3+?$ $5=2+?$

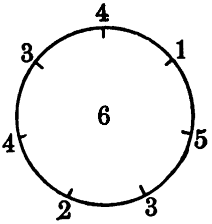
Add:

6. $\begin{array}{r}2\\ \underline{1}\end{array}\quad \begin{array}{r}1\\ \underline{2}\end{array}\quad \begin{array}{r}3\\ \underline{1}\end{array}\quad \begin{array}{r}1\\ \underline{3}\end{array}\quad \begin{array}{r}4\\ \underline{1}\end{array}\quad \begin{array}{r}1\\ \underline{4}\end{array}\quad \begin{array}{r}4\\ \underline{2}\end{array}\quad \begin{array}{r}2\\ \underline{4}\end{array}$

7. Give all the combinations that make 4.
8. Give all the combinations that make 5.
9. Give all the combinations that make 6.
10. In the first circle add the number inside the circle to the numbers outside it.

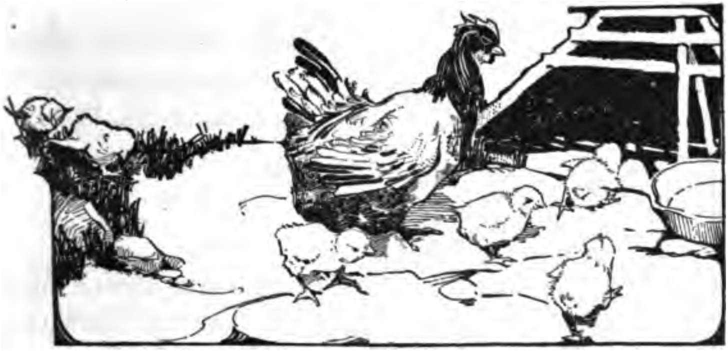






11. In the other circles add enough to the outside numbers to make the sum the inside numbers. Give the inside number first. Read the examples this way: $5=2+3$.

See page 292.



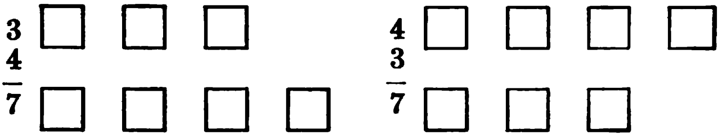
ORAL EXERCISES

1. How many little chickens are there in the picture?
2. How many tired little chickens are coming home behind the others?
3. Four chickens and two chickens are how many chickens?
4. The mother hen calls "Cluck, cluck, cluck, cluck, cluck, cluck, cluck, cluck, cluck, cluck." How many times does she call?
5. All the chickens went into the field with their mother. Three chickens walked on one side of her, two walked on the other side. One chicken walked behind her. How many chickens went into the field?
6. William tells this number story about little chickens: "A hen had 6 chickens and lost 2 of them. Then she had   chickens." What is the number left out?
7. Tell some more number stories about little chickens.

Use these sums in your stories:

$3+3$, $2+3$, $2+4$, $2+2$, $1+5$, $4+1$

See page 292.



ORAL EXERCISES

1. Add:

4	5	6
3	2	1

If you have trouble in finding the sums make dots or marks and count them. Learn these sums so that you know them well.

Give sums rapidly:

2\.

4	3	5	2	6	1	3	2
3	4	2	5	1	6	3	2

3\.

3	2	4	2	5	1	3	1
2	3	2	4	1	5	1	3

Drill on these so that you can use them quickly in reading the stories on the next page.

New Number Facts

$6+1=7$ $5+2=7$ $4+3=7$

Read and supply the missing numbers:

4. 7=4+? 7=3+? 7=5+? 7=2+?
5. 7=6+? 7=1+? 6=5+? 6=1+?
6. 6=4+? 6=2+? 5=4+? 5=1+?
7. 5=3+? 5=2+? 4=3+? 4=1+?
8. 3=2+? 3=1+? 6=3+? 4=2+?

WRITTEN EXERCISES

9. Write all combinations that make 7.
10. Write all combinations that make 6.
See page 292.

ORAL EXERCISES

1. The boys buy a spool of thread for 4 cents and a skein of silk for 3 cents. How much do they pay for both?

2. The price of a paper of needles is 5 cents. How much do they pay for one paper of needles and one two-cent stamp?

3. How much would they have to pay for two two-cent stamps?

4. The price of a skein of silk is 3 cents. How much would they pay for two skeins of silk?

5. How much would they pay for a spool of thread and a two-cent stamp?

These boys are going to the store for their mother.

A stick of candy for 1 cent
A stamp for 2 cents
A skein of silk for 3 cents
A spool of thread for 4 cents
A paper of needles for 5 cents

6. How much would they pay for a paper of needles and a stick of candy?

7. How much would they pay for 2 sticks of candy and a spool of thread?

8. How much would they pay for a skein of silk and 3 sticks of candy?

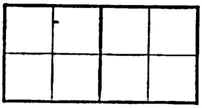
9. Make other number stories about going to the store.

See page 293.

ORAL EXERCISES

1. Cut out little squares of paper and put them together like they are in this figure.

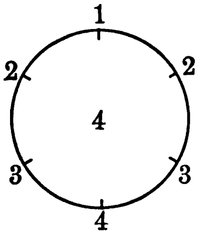
The figure shows that 4+4=8

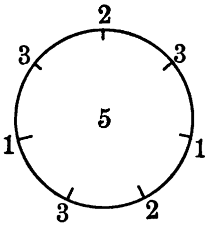


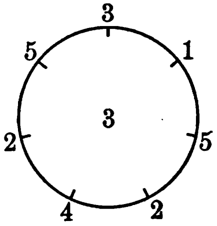
2. Add:

$$\begin{array}{cccc} 4 & 5 & 6 & 7 \\ \underline{4} & \underline{3} & \underline{2} & \underline{1} \end{array}$$

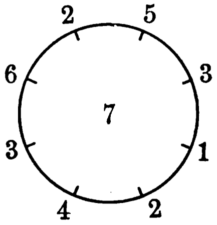
If you have trouble in finding the sums draw squares or make marks and add them. Learn these sums so that you know them well.

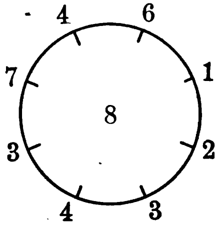






3. Add the number inside each circle to the numbers outside the circle. See how fast you can go around each circle without making a mistake.





New Number Facts
4+4=8
5+3=8
6+2=8
7+1=8

4. In these circles add enough to the outside numbers to make the sums the inside numbers. See how fast you can go around each circle without making a mistake. Go around the circles both ways.

See page 293.

ORAL EXERCISES

Add:

1.	4	5	2	5	3	3	2	6	2
	4	2	5	3	5	2	3	2	6
2.	7	1	2	1	2	4	3	4	2
	1	7	1	2	2	3	4	2	4
3.	3	1	5	1	4	1	6	1	3
	1	3	1	5	1	4	1	6	3

Read and supply the missing numbers:

4. 5=3+? 5=2+? 5=4+? 5=1+?
5. 6=5+? 6=1+? 6=4+? 6=2+?
6. 7=4+? 7=3+? 7=5+? 7=2+?
7. 7=6+? 7=1+? 8=7+? 8=1+?
8. 8=6+? 8=2+? 8=5+? 8=3+?
9. 2=1+? 4=2+? 6=3+? 8=4+?

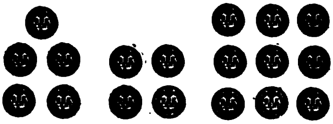
Give sums rapidly:

10.	1	3	2	4	3	4	2	6	3
	3	1	4	2	4	3	6	2	3
11.	4	2	1	2	3	2	5	1	4
	4	2	2	3	2	5	2	4	1
12.	1	7	3	5	4	1	6	1	5
	7	1	5	3	4	6	1	5	1

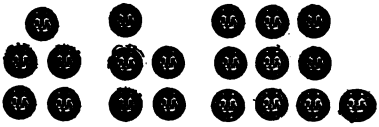
WRITTEN EXERCISES

1. Write all the combinations that make 6.
2. Write all the combinations that make 7.
3. Write all the combinations that make 8.

See page 294.



5 + 4 = 9



5 + 5 = 10

ORAL AND WRITTEN EXERCISES

1. How many cents are 8 cents and 1 cent? 7 cents and 2 cents? 6 cents and 3 cents? 5 cents and 4 cents? Make rings to show each of these.
2. How many cents are 9 cents and 1 cent? 8 cents and 2 cents? 7 cents and 3 cents? 6 cents and 4 cents? 5 cents and 5 cents? Make rings or dots to show each of these.
3. Make dots to show how many cents you must add to 6 cents to make 9 cents.
4. John has 9 cents and spends 3 cents; how many cents has he left?
5. Make dots to show how many cents you must add to 6 cents to make 10 cents.
6. Mary has 10 cents and spends 6 cents; how many cents has she left?
7. Tell some number stories about spending money.

New Number Facts

8+1=9
7+2=9
6+3=9
5+4=9
9+1=10
8+2=10
7+3=10
6+4=10
5+5=10

Learn these new number facts well, so that you can use them in finding the sums on the next page.

See page 294.

ORAL EXERCISES

Add:

1.	8	2	6	3	7	2	6	4	5
	2	8	3	6	2	7	4	6	5
2.	9	1	5	4	8	1	7	3	2
	1	9	4	5	1	8	3	7	2
3.	6	2	5	2	4	3	5	3	4
	2	6	2	5	3	4	3	5	4
4.	1	1	6	1	2	6	5	3	7
	1	3	1	6	4	3	4	5	2
5.	3	4	3	2	5	4	6	8	6
	3	3	4	7	3	5	3	2	4

Read and supply the missing numbers:

6. 10=9+? 10=1+? 10=8+? 10=2+?
7. 10=7+? 10=3+? 10=4+? 10=6+?
8. 9=8+? 9=1+? 9=7+? 9=2+?
9. 9=6+? 9=3+? 9=5+? 9=4+?
10. 8=7+? 8=1+? 8=6+? 8=2+?
11. 8=5+? 8=3+? 7=6+? 7=1+?
12. 7=2+? 7=5+? 7=4+? 7=3+?
13. 6=4+? 5=2+? 5=3+? 6=3+?
14. Make circles on the board like those shown on page 10 and see how fast you can go around them without making a mistake. The teacher will help you to make the circles and write the numbers. First decide the largest number you can use as a sum. How will this help you writing the numbers?

See page 295.

ORAL EXERCISES

1. Henry is 6 years old. Elsie is 2 years older than Henry. How old is Elsie?

2. If Henry is 6 years old to-day, how old will he be 3 years from now?

3. If Elsie is 8 years old now, how old will she be 2 years from now?

4. If Elsie is 8 years old now, how old was she 3 years ago? How old was she 5 years ago?

5. If John is 6 years old now, how old was he 3 years ago?

6. How many pages have you studied in your arithmetic this year? Count till you come to this number.

7. On what page is your reading lesson today? Count till you come to this number.

8. How many pages are there in the longest story in your reader? in the shortest?

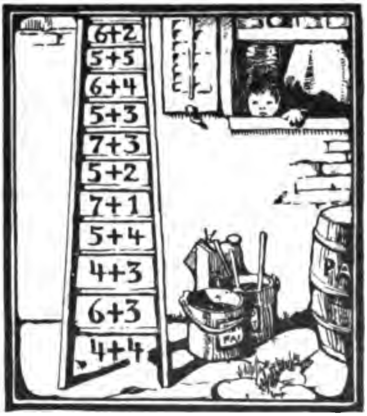
9. If you read four pages each day, how many pages will you read in two days?

10. If you read five pages each day, how many pages will you read in two days?

See page 295.

ORAL EXERCISES

1. Give the sum of the two numbers on each step of this ladder going up. See how fast you can climb the ladder. Then see how fast you can come down again.

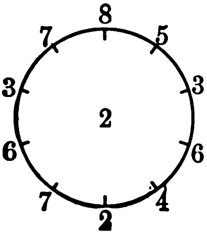


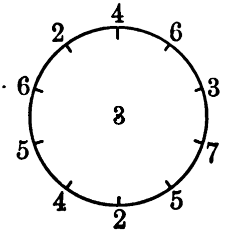
When the children make mistakes they say they fall off the ladder.

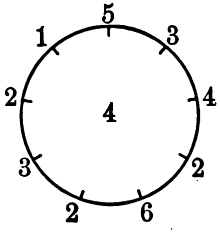
2. Add the numbers outside the first circle to the number in the center. See how quickly you can go around the circle. First go around the circle one way, and then the other way.

Do the same with the other two circles.

The children call this running around the circle. When they make mistakes they say they fall down.







3. Make circles on the board like these and see how fast you can run around them without falling. The teacher will help you to make the circles.

4. Make a number ladder on the board, and see how fast you can climb it without falling off.

See page 295.

These children are playing store. They use play money.

Five **cents** = one **nickel.**
Ten **cents** = one **dime.**

ORAL EXERCISES

1. John buys a top for 4 cents. If he gives the storekeeper a dime, how much change does he get? In making change the storekeeper starts with 4 cents, and then adds enough to make 10 cents. He gives John the top and says: "4 cents;" then he puts down a penny and says: "5 cents;" then puts down a nickel and says: "10 cents." That is, he finds what must be added to 4 cents to make 10 cents.

2. Mary buys a mud cake for 5 cents and some crackers for 4 cents. How much must she pay?

3. Henry tells a story about playing store. He says: "I bought a whistle for 3 cents and a ball for 6 cents. I paid   cents for both together."

4. Play store. Tell some stories about playing store. Make change as the storekeeper does.

See page 296.

Problem. John had 7 marbles in a bag and took out 3 of them; how many were left in the bag?

We can find the answer to this question in two ways, and the teacher will tell you which one you are to use.

If the marbles left in the bag are added to those taken out, we know that the sum is 7 marbles. But we know that 4 must be added to 3 to make 7, and so we know that there are 4 marbles left in the bag.

First Method

We can find by counting that if we have 7 things and take away 3 of them we will have 4 left. So we know that there are 4 marbles left in the bag.

Second Method

Subtraction is **taking away.**

The sign − is the sign of Subtraction. It is read **less** or **minus.**

When 3 is to be subtracted from 7 the problem may be written 7−3=? This is read "7 less 3=what?" or "7 minus 3=what?" When you know that 4+3=7 you should know at once the missing number in 7−3=?, 7−4=?.

Instead of 7−3=? or 7=3+? we often write the smaller number below the larger and then say "subtract".

$\boxed{\begin{array}{c}7\\ \underline{3}\\ 4\end{array}}$

ORAL EXERCISES

Subtract:

1	10	8	4	9	10	8	9	7	7
	6	3	2	3	5	4	4	3	5
	—	—	—	—	—	—	—	—	—

2. 8−2=? 7−4=? 9−6=? 8−3=?
3. 7−5=? 10−8=? 7−3=? 10−7=?

See page 296.

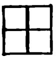
ORAL EXERCISES

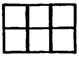
1. Count these boys by 2's, thus: 2, 4, 6, 8, 10.

2. Count by 2's // // // //.

3. How many 2's are there in 4?

4. Three 2's are how many?





5. Four 2's are how many? Draw squares to show this.

Instead of "four 2's are 8" we write $4 \times 2 = 8$, and read it "4 times 2 are 8" or "4 times 2 equal 8."

> The sign × is read **times** or **time**.

We say that in $4 \times 2 = 8$, 2 is *multiplied* by 4, and that the *product* of 4 and 2 is 8.

6. Read and supply the missing numbers in:
$2 \times 2 = ?$ $4 \times 2 = ?$ $3 \times 2 = ?$ $5 \times 2 = ?$

7. From : | : | : = $\frac{\cdot\cdot\cdot}{\cdot\cdot\cdot}$ we see that $3 \times 2 = 2 \times 3$.
Make dots to show that $4 \times 2 = 2 \times 4$ and $5 \times 2 = 2 \times 5$.

New Number Facts

$2 \times 2 = 4$ $3 \times 2 = 6$ $4 \times 2 = 8$ $5 \times 2 = 10$
$2 \times 3 = 6$ $2 \times 4 = 8$ $2 \times 5 = 10$

8. At two cents each what is the cost of 4 stamps?

See page 298.

The teacher shows the class a card with the numbers 4 and 5 on it, and the children write the sum 9.

She next shows a card with 4 and 3, and the children write the sum 7.

When she has shown 5 cards, each child should have five answers. The row with the fewest mistakes gets the flag.

Play this game until you can give the sums quickly and without making any mistakes.

If some combination gives you trouble, write it down and make sure you learn it.

The pupils can help to make the cards by writing the numbers on them.

WRITTEN EXERCISES

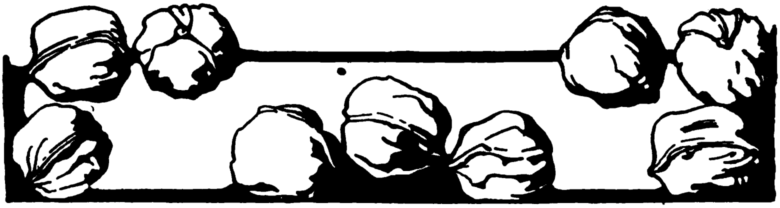
1. Write all the combinations that make 8.

Thus, $\boxed{\begin{matrix}1\\7\end{matrix}}$, $\boxed{\begin{matrix}2\\6\end{matrix}}$, etc.

2. Write all the combinations that make 9.

3. Write all the combinations that make 10.

See page 298.



ORAL EXERCISES

1. How many nuts are there in each group? How many nuts are there altogether?
2. Count to nine by 3's.
3. Count to 10 by 3's beginning with 1. / /// /// ///
4. Count to 8 by 3's beginning with 2. Show this.
5. How many groups of 3 dots can you make out of 6 dots?
6. How many groups of 2 dots can you make out of 6 dots?
7. How many groups of 3 dots can you make out of 9 dots?
8. Read and supply the missing numbers in:

$2\times3=?$ $3\times2=?$ $3\times3=?$

Instead of "how many 2's are there in 6," we write $?\times2=6$.

New Number Fact, $3\times3=9$

WRITTEN EXERCISES

Copy and supply the missing numbers in the following:

1. $2\times2=?$
$?\times2=4$
$2\times?=4$
$3\times3=?$
$?\times3=9$
$3\times?=9$

2. $2\times3=?$
$3\times2=?$
$?\times3=6$
$2\times?=6$
$?\times2=6$
$3\times?=6$

3. $4\times2=?$
$2\times4=?$
$?\times2=8$
$4\times?=8$
$?\times4=8$
$2\times?=8$

4. $5\times2=?$
$2\times5=?$
$?\times2=10$
$5\times?=10$
$?\times5=10$
$2\times?=10$

See page 299.

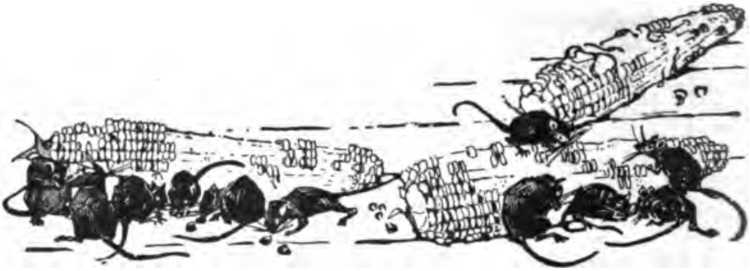
At a book-store prices of school-supplies are:

Pencil	1 cent	Tablet	3 cents
Eraser	3 cents	Box of crayons	5 cents
Ruler	1 cent	Small paste tube	4 cents
Penholder	2 cents	Blank Book	6 cents

ORAL EXERCISES

1. Are these prices higher or lower than those you pay at your book-store?
2. What is the cost of a pencil and a tablet?
3. What is the cost of a ruler, a pencil, and an eraser?
4. What is the cost of 2 penholders? of 2 tablets? of 3 erasers? of 2 paste tubes?
5. What is the cost of a paste tube and a blank book?
6. What is the cost of an eraser and a box of crayons?
7. What can you buy for 5 cents?
8. What can you buy for 7 cents?
9. What can you buy for 8 cents?
10. What can you buy for 9 cents?
11. What can you buy for 10 cents?
12. How much more does a blank book cost than a penholder?
13. How much more does a paste tube cost than a tablet?
14. If you have 10 cents and buy a blank book for 6 cents, how much have you left?
15. If you have 10 cents and buy a paste tube for 4 cents, how much have you left?
16. Tell number stories about buying things at this store.

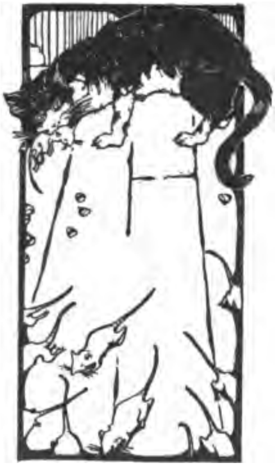
See page 299.



ORAL EXERCISES

1. How many mice are there in the group to the left? In the group to the right?

2. Five mice and six mice are how many mice?



3. How many mice are 10 mice and 1 mouse?

4. How many mice are 9 mice and 2 mice? 8 mice and 3 mice? 7 mice and 4 mice?

5. How many mice has the cat caught? How many are running away?

6. If the cat had caught 2 mice, how many would be left?

7. How many would be left if the cat had caught 3 mice? If she had caught 4 mice?

8. How many of these mice would be left if the cat caught 5 of them? if she caught 6 of them?

9. Tell number stories about mice and a cat. See who can tell the best stories.

See page 300.

The number eleven is written 11.

New Number Facts

9 + 2 = 11 8 + 3 = 11 7 + 4 = 11 6 + 5 = 11

The most important addition facts are those in which both numbers to be added are less than 10. Only those are given in the "New Number Facts."

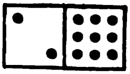
Add:

ORAL EXERCISES

9	2	8	3	7	4	6	5	5
2	9	3	8	4	7	5	6	5

WRITTEN EXERCISES

1. Write all the combinations that make 11. Make a card like this to show each combination.



Subtract:

2.	11	11	11	11	11	11	11	11	11
	9	2	8	3	7	4	6	5	1
3.	10	10	10	10	10	10	10	10	10
	9	1	8	2	7	3	6	4	5
4.	9	9	9	9	9	9	9	9	8
	8	1	7	2	6	3	4	5	4

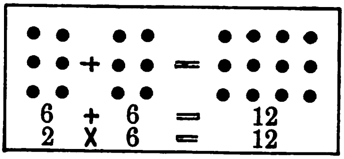
5. Play the game on page 19 using numbers whose sums are 7 or less.

6. Play the game on page 19 using mixed cards with numbers whose sums are 8, 9, 10, 11.

Make a list of combinations that give you trouble, and practice on them until you know them well.

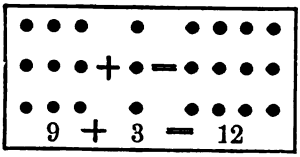
See page 300.

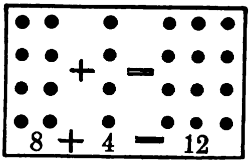
The number twelve is written 12.



ORAL EXERCISES

1. Two 6's are how many? How many 6's are there in 12?
2. Count to 12 by 2's. // // // // // //
3. How many 2's are there in 12?





4. Count to 12 by 3's. How many 3's are there in 12?
   9+3=how many?

WRITTEN EXERCISES

1. Make groups of dots to show that 4+8=12.
2. Make dots or count sticks to show that 7+5=12.

New Number Facts

9+3=12 7+5=12 2×6=12
8+4=12 6+6=12 6×2=12

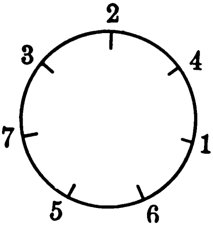
3. Copy and write the sums of the following. If you have trouble in finding the sums, make dots or count sticks.

5	5	6	4	7	5	10	11	10
4	5	5	5	5	7	1	1	2
—	—	—	—	—	—	—	—	—

See page 300.

These children are playing a number game. John stands up and closes his eyes while the teacher writes a number combination as, 5+7, on the board and then erases it. John opens his eyes and the other children say: "The sum is 12." John then says: "Is it 4+8=12?" "No, it is not 4+8=12." "Is it 6+6=12?" "No, it is not 6+6=12." "Is it 5+7=12?" Then the children clap their hands. If John makes a mistake, he sits down, and the child who first notices the mistake takes his place and closes his eyes, while the teacher writes a new combination on the board. If John makes no mistakes he is allowed to guess for two sums.

ORAL EXERCISES

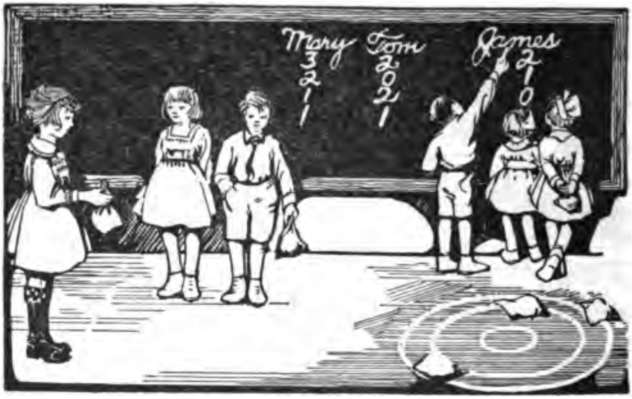


1. Beginning with 1, add 2 to each number around the circle.

See how fast you can go around without making a mistake. Also go around in the other direction.

2. Beginning with 1, add 3 to each number around the circle, add 4 to each number. Go around both ways.
3. Beginning with 1, add enough to each number around the circle to make the sum 10.

See page 301.



Mary's Score	Tom's Score	James' Score
3	2	2
2	0	1
1	2	0
1	1	1

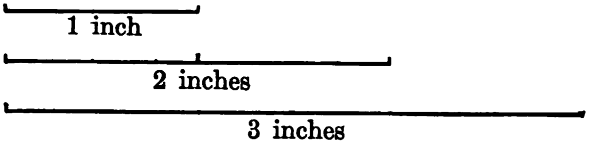
These children are playing bean-bag. Each child throws four bags. A bag counts 3 when it goes inside the smallest circle, 2 when it goes inside the next, but not inside the smallest; and 1 when it goes inside the largest, but not inside the next one. When the bag misses all the circles, it does not count anything. Then the score-keeper marks 0.

> The figure 0 means *not any*, and is called **naught** or **zero.**

ORAL EXERCISES

1. Add the score of each child. Adding Mary's score, say 3, 5, 6, 7. Do not say $3+2=5$, $5+1=6$, $6+1=7$.
2. What is the difference between Mary's score and Tom's score? between Mary's and James'? between Tom's and James'?

See page 301.



ORAL EXERCISES

1. On a foot ruler show 1 inch, 2 inches, 3 inches, 4 inches, 5 inches, 6 inches.
2. How many inches wide do you think this page is? Measure to see if you are right.
3. How many inches long do you think this page is? Measure to see if you are right.
4. How many inches long is your ruler?

Twelve inches = one foot. (12 in. = 1 ft.)

Sometimes we write ft. instead of foot or feet, and in. instead of inch or inches.

5. 6 inches and 6 inches are how many inches?
6. 8 inches and 4 inches are how many inches?
7. 10 inches and 2 inches are how many inches?
8. John has one pencil 4 inches long and another 5 inches long. How long are the two pencils together?
9. 9 inches and 3 inches are how many inches?

Play a game estimating the lengths of lines drawn on the board. All the children make estimates. Then they measure to see who is most nearly right. The number of inches by which a child's estimate misses is put down, and the sum for five estimates is found. The child with the smallest score wins. Measures are all made to the nearest inch.

See page 301.

When a thing is divided into two equal parts each part is called one-half of the thing.
One-half is written ½ or $\frac{1}{2}$.

ORAL AND WRITTEN EXERCISES

1. Point to one-half of the 4 dots. • •
½ of 4 is how many? • •

2. Point to one-half of the 6 dots. • •
½ of 6 is how many? • • • •

3. Point to one-half of the 8 dots. • • • •
½ of 8 is how many? • • • •

4. ½ of 10 is how many? ///// /////

5. ½ of 12 is how many?
* * * * * *
* * * * * *

6. How many inches are there in a foot ruler? How many inches are there in ½ of a foot ruler?

7. Draw a line 6 inches long. How many inches are there in ½ of it?

8. Draw a line 10 inches long. How many inches are there in ½ of it?

9. If you have 4 apples and give away ½ of them, how many do you give away?

10. If you have 10 cents and spend ½ of them how many cents have you left?

11. Read and give the missing numbers:

½ of 6 = ? ½ of 8 = ? ½ of 10 = ? ½ of 12 = ?
3 is ½ of ? 4 is ½ of ? 5 is ½ of ? 6 is ½ of ?

12. Tell number stories about halves of numbers.
See page 302.

When a thing is divided into four equal parts each part is called **one-fourth** of the thing.
One-fourth is written ¼ or $\frac{1}{4}$.

When a thing is divided into three equal parts, each part is called **one-third** of the thing.
One-third is written ⅓ or $\frac{1}{3}$.

ORAL EXERCISES

1. Point to ¼ of the 4 dots. • •
   ¼ of 4 is how many? • •
2. Point to ¼ of the 8 stars. * * * *
   ¼ of 8 is how many? * * * *
3. Point to ⅓ of the 6 dots. • • •
   ⅓ of 6 is how many? • • •

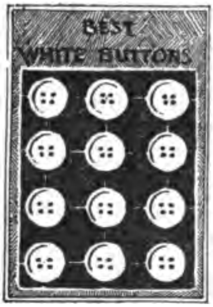
We know that ½ of 6 = 3 *because* 2 × 3 = 6.
Also we know that ⅓ of 9 = 3 *because* 3 × 3 = 9.
Read and supply the missing numbers:

4.	2 × 2 = ?	2 × 3 = ?	2 × 4 = ?
	½ of 4 = ?	½ of 6 = ?	½ of 8 = ?
5.	2 × 5 = ?	2 × 6 = ?	2 × 1 = ?
	½ of 10 = ?	½ of 12 = ?	½ of 2 = ?
6.	3 × 2 = ?	3 × 3 = ?	3 × 4 = ?
	⅓ of 6 = ?	⅓ of 9 = ?	⅓ of 12 = ?
7.	4 × 1 = ?	4 × 2 = ?	4 × 3 = ?
	¼ of 4 = ?	¼ of 8 = ?	¼ of 12 = ?

8. Tell number stories about halves, thirds and fourths.
9. Play the game on page 19, using cards with combinations like "½ of 6" and "⅓ of 9."

See page 302.

ORAL EXERCISES



1. How many buttons are there on this card?

2. How many buttons are there on one-half of the card?

3. One-half of 12 is how many?

4. Two 6's are how many?
   This we write: $6+6=?$ or $2\times6=?$

5. The card can be cut cross-wise into how many equal parts? What part of the whole card is each piece? How many buttons are there on each of these 4 pieces?

6. How many 3's are there in 12?

7. ¼ of 12 is how many?

8. Four 3's are how many? This we write $3+3+3+3=?$ or $4\times3=?$

9. Three 4's are how many? This we write $4+4+4=?$ or $3\times4=?$

New Number Facts: $3\times4=12$, $4\times3=12$

10. The card can be cut lengthwise into 3 strips. How many buttons will there be on each strip?

11. How many 4's are there in 12?

12. ⅓ of 12 is how many?

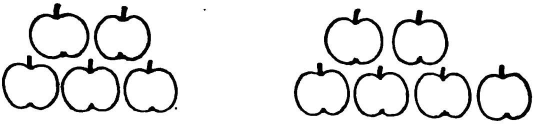
13. How many 2's are there in 12?

14. Count the buttons on this card by 2's, pointing to the buttons as you count.

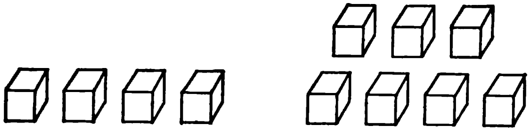
15. Tell number stories about parts of 12.

See page 302.

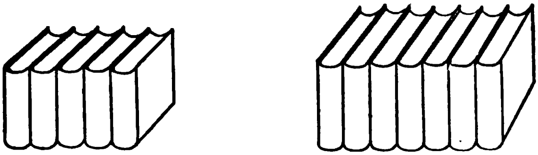
ORAL EXERCISES



1. 5 apples and 6 apples are how many apples?



2. 4 cubes and 7 cubes are how many cubes?



3. 5 books and 7 books are how many books?

4. Read the following and supply the missing numbers:

5+6=? 4+7=? 5+7=?
11−5=? 11−4=? 12−5=?
11−6=? 11−7=? 12−7=?

We know that 11−5=6 *because* 6+5=11.

5. How do you know that 11−6=5? 11−4=7? 11−7=4?

6. John pays 6 cents for a tube of paste and 5 cents for a box of crayons. How much does he pay for both?

7. Mary pays 7 cents for a copy book and 5 cents for a box of crayons. How much does she pay for both?

8. Charles pays 4 cents for a blank book and 7 cents for a copy book. How much does he pay for both?

See page 303.

ORAL EXERCISES

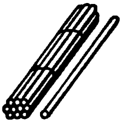
The following are all the addition combinations given thus far in this book:

1.	4	2	3	1	8	3	6	1	8	4
	2	4	1	3	3	8	1	6	4	8
2.	9	1	7	5	6	3	2	3	2	1
	1	9	5	7	6	3	3	2	1	2
3.	7	3	2	1	7	1	8	2	6	4
	3	7	2	1	1	7	2	8	4	6
4.	5	3	5	2	5	1	6	2	4	3
	3	5	2	5	1	5	2	6	3	4
5.	6	5	4	1	6	3	7	4	9	2
	5	6	1	4	3	6	4	7	2	9
6.	8	1	7	2	4	5	4	9	3	5
	1	8	2	7	4	4	5	3	9	5

Following are all except the simplest of these arranged in different order. See how fast you can give all the sums.

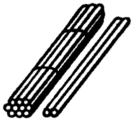
7.	4	9	7	5	6	1	2	2	3	3
	2	1	3	3	5	8	4	9	7	5
8.	5	8	3	5	2	5	4	7	3	7
	6	4	4	7	2	2	6	2	9	5
9.	1	2	4	2	8	6	8	1	6	4
	9	5	3	7	3	6	1	5	3	4
10.	1	3	2	1	8	5	6	3	4	3
	6	3	3	7	2	5	2	6	7	8
11.	5	9	4	9	7	2	2	3	6	4
	4	3	5	2	4	6	8	2	4	8

See page 303.



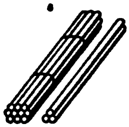
10+1=11

Eleven
11



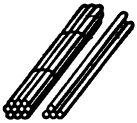
10+2=12

Twelve
12



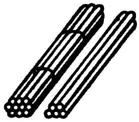
10+3=13

Thirteen
13



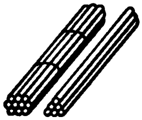
10+4=14

Fourteen
14



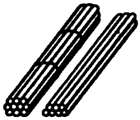
10+5=15

Fifteen
15



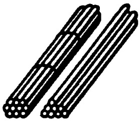
10+6=16

Sixteen
16



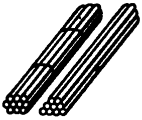
10+7=17

Seventeen
17



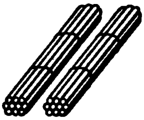
10+8=18

Eighteen
18



10+9=19

Nineteen
19



10+10=20

Twenty
20

Ten, written 10, means 1 *ten* and no *one*. 11 means 1 *ten* and 1 *one*. 12 means 1 *ten* and 2 *ones*.

ORAL EXERCISES

What is the meaning of each of the numbers:
13, 14, 15, 16, 17, 18, 19, 20?

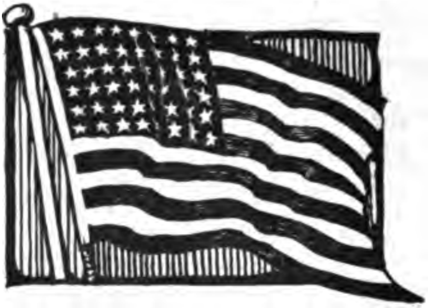
WRITTEN EXERCISES

1. Write and read the numbers from 12 to 20.

2. Copy and add:

10	10	10	10	10	10	10	10	10
2	3	4	5	6	7	8	9	10
—	—	—	—	—	—	—	—	—

See page 303.



ORAL EXERCISES

1. How many stripes are there on the flag?

2. How many white stripes are there on the flag?

3. How many red stripes are there on the flag?

4. 6 stripes and 7 stripes are how many stripes?

5. How many stripes must be added to 6 stripes to make 13 stripes?

6. How many stripes must be added to 7 stripes to make 13 stripes?

New Number Facts
9+4=13
8+5=13
7+6=13

7. How many stripes are 8 stripes and 5 stripes? 9 stripes and 4 stripes?

Subtract:

8.	13	13	13	13	13	13	13	13
	4	5	9	6	4	3	7	8

Find the missing numbers in the following:

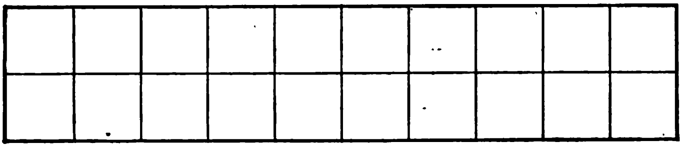
9. 13=6+? 13=7+? 13= 5+? 13=8+?

10. 13=4+? 13=9+? 13=10+? 13=3+?

11. 12=7+? 12=5+? 12= 8+? 12=4+?

12. 12=9+? 12=3+? 12= 6+? 12=2+?

See page 304.



ORAL EXERCISES

1. How many squares are there in this rectangle?

2. Count to 20 by 2's. Each time that you count point to two squares.

Supply the missing numbers in the following. If you have trouble finding the numbers count squares in the figure at the top of this page.

3. Two 2's are   , three 2's are   , four 2's are   ,
five 2's are   , six 2's are   , seven 2's are   ,
eight 2's are   , nine 2's are   , ten 2's are   .

4. 2×2=?   5×2=?   8×2=?
3×2=?   6×2=?   9×2=?
4×2=?   7×2=?   10×2=?

5. From : | : | : | : | : | : = ÷ ÷ ÷ ÷ ÷ ÷ we see that 6×2=2×6. In this manner show that 7×2=2×7, 8×2=2×8, and 9×2=2×9.

6. Give the products of 2×6, 2×7, 2×8, 2×9, 2×10.

New Number Facts			
7×2=14	8×2=16	9×2=18	10×2=20
2×7=14	2×8=16	2×9=18	2×10=20

7. Add:

2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10
—	—	—	—	—	—	—	—	—

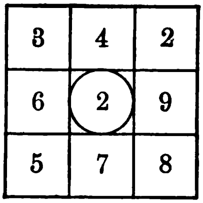
From these sums find 2×2, 2×3, 2×4, 2×5, 2×6, 2×7, 2×8, 2×9, 2×10.

See page 304.

ORAL EXERCISES

In 3×4 we say we **multiply** 4 by 3.

1. Multiply the numbers in the squares by the number in the circle.



3	4	2
6	2	9
5	7	8

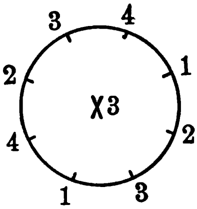
We often write numbers to be multiplied, one above the other as in addition, and then say "multiply" or "find the product".

$$\boxed{\begin{array}{c}3\\ \underline{2}\\ 6\end{array}}$$

Multiply:

2. $$\begin{array}{ccccccccc}3&2&5&2&6&2&2&1&3\\ \underline{2}&\underline{3}&\underline{2}&\underline{5}&\underline{2}&\underline{6}&\underline{1}&\underline{2}&\underline{3}\end{array}$$

3. $$\begin{array}{ccccccccc}2&7&2&9&8&2&2&4&2\\ \underline{7}&\underline{2}&\underline{9}&\underline{2}&\underline{2}&\underline{8}&\underline{4}&\underline{2}&\underline{2}\end{array}$$



4. Multiply the numbers outside the circle by 3. Go around the circle both ways. Also multiply each number outside the circle by 2.

Read and supply the missing numbers:

5. $10=5\times?$ $10=?\times5$ $16=8\times?$ $16=?\times2$
6. $12=?\times6$ $12=?\times2$ $18=9\times?$ $18=2\times?$
7. $14=7\times?$ $14=2\times?$ $8=4\times?$ $8=?\times2$
8. $4=?\times2$ $6=?\times2$ $6=3\times?$ $9=?\times3$
9. $12=?\times3$ $12=4\times?$ $3=3\times?$ $4=1\times?$

Learn each number fact of the tables *separately* so that you can give it instantly.

Play a game like the one on page 19, using number facts from the tables you have learned.

See page 304.

Review and Drill

You should now know all the number combinations on this page except those in the "New Number Facts" given below. Make marks or dots, or count sticks to show these new number facts.

New Number Facts		
9+5=14	8+6=14	7+7=14

ORAL EXERCISES

Add:

1.	9	5	8	6	7	3	9	9	4
	5	9	6	8	7	9	4	3	9
2.	9	8	3	7	3	2	6	4	7
	2	3	6	4	8	9	3	7	2
3.	7	4	5	5	6	5	7	3	2
	5	5	3	4	7	7	6	5	7
4.	8	6	8	5	4	5	7	8	3
	5	5	4	6	8	8	3	3	7

Subtract:

5.	14	14	14	14	14	13	13	13
	9	5	8	6	7	4	7	6
6.	13	13	13	12	12	12	12	12
	8	5	9	6	7	5	8	4
7.	12	12	11	11	11	11	11	11
	9	3	6	5	7	4	8	3

8. Play the game on page 19.

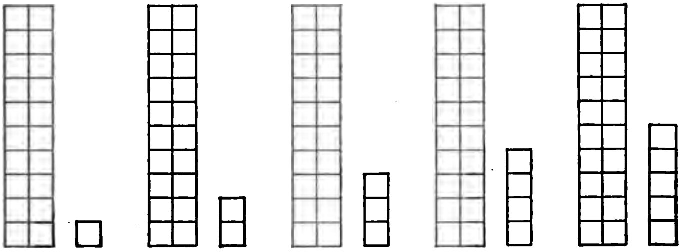
See page 305.

ORAL AND WRITTEN EXERCISES

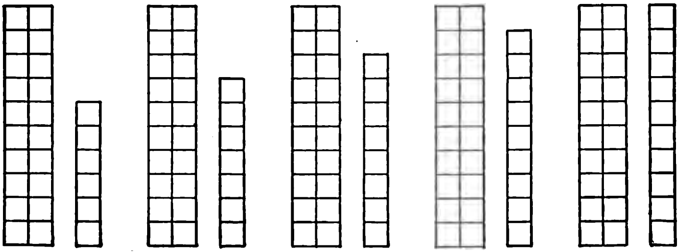
1. How many tens and how many ones are there in each of these numbers: 14, 18, 11, 15, 19, 17, 13, 16, 12?

2. Give the sums of the following:

10	10	10	10	10	10	10	10
8	4	6	3	9	7	5	2



20 + 1 = 21, 20 + 2 = 22, 20 + 3 = 23, 20 + 4 = 24, 20 + 5 = 25



20 + 6 = 26, 20 + 7 = 27, 20 + 8 = 28, 20 + 9 = 29, 20 + 10 = 30

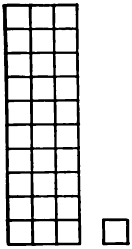
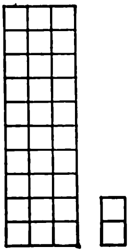
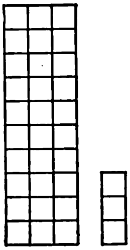
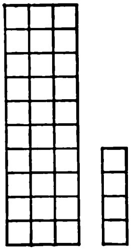
3. Write all the numbers from 20 to 30 and read them.

4. The number 24 means 2 *tens* and 4 *ones*. What does each of the following mean: 27, 23, 29, 21, 28, 22, 26, 25?

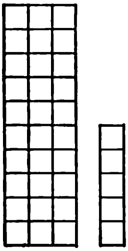
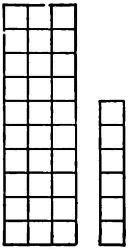
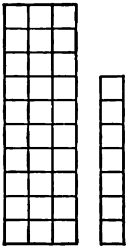
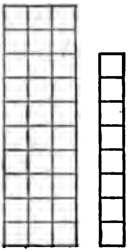
5. Give the sums of the following:

20	20	20	20	20	20	20	20	20
4	8	6	3	9	7	5	2	1

See page 305.

30 + 1 = 31, 30 + 2 = 32, 30 + 3 = 33, 30 + 4 = 34

30 + 5 = 35, 30 + 6 = 36, 30 + 7 = 37, 30 + 8 = 38

ORAL EXERCISES

1. Count from 30 to 40 and draw a figure like those above for the number 39. Write the numbers.

2. Count from 40 to 50 and draw a figure for the number 47.

3. 32 means 3 *tens* and 2 *ones*. What does each of the following mean? 35, 37, 33, 39, 31, 38, 36, 34?

4. Add:

Add:	30	30	30	30	30	30	30	30
	4	8	6	3	9	7	5	2

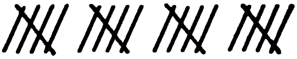
5. 45 means 4 *tens* and 5 *ones*. What does each of the following mean: 44, 46, 48, 41, 42, 49, 43, 47?

6. Add:

Add:	40	40	40	40	40	40	40	40
	2	5	7	9	3	6	8	4

See page 305.

ORAL AND WRITTEN EXERCISES



1. How many marks are there in each group? Notice that there are four marks running the same way and one drawn across them. This is the usual way of "keeping tally." (See page 102.)

2. Make five groups of tally marks. Count to 25 by 5's.

3. How many marks are there in two groups? in 3 groups? in 4 groups? in 5 groups?

New Number Facts

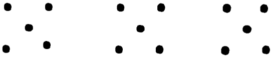
3×5=15　　4×5=20　　5×5=25
5×3=15　　5×4=20

Copy and supply the missing numbers:

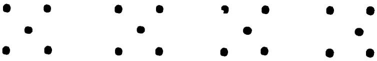
4. 2×5=?　　3×5=?　　4×5=?　　5×5=?
5. 2×?=10　　?×5=10　　3×?=15　　?×5=15
6. 4×?=20　　?×5=20　　5×?=25　　?×5=25

7. Find ½ of 10.

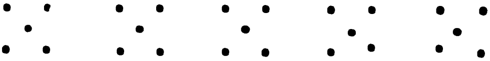
8. Find ⅓ of 15.



9. Find ¼ of 20.



10. Find ⅕ of 25.



See page 305.

ORAL AND WRITTEN EXERCISES

Make 10 groups of tally marks with 5 marks in each, as shown on the opposite page.

1. How many marks are there in 6 groups of 5 each? in 7 groups? in 8 groups? in 9 groups? in 10 groups?

2. Count to 50 by 5's.

3. Copy and supply the missing numbers in $6\times5=?$ $7\times5=?$ $8\times5=?$ $9\times5=?$ $10\times5=?$

4. How many 5's are there in 10? in 15? in 20? in 25? in 30? in 35? in 40? in 45? in 50?

5. Copy and supply the missing numbers in
$6\times?=30$ $?\times5=30$ $7\times?=35$ $?\times5=35$
$8\times?=40$ $?\times5=40$ $9\times?=45$ $?\times5=45$
$10\times?=50$ $?\times5=50$ $5\times?=25$ $?\times5=20$

6. Read and supply the missing numbers in
$2\times5=\ ?$ $3\times5=\ ?$ $4\times5=\ ?$ $5\times5=\ ?$
$3\times?=15$ $?\times5=20$ $5\times?=25$ $?\times5=10$
$4\times?=20$ $2\times?=10$ $?\times5=25$ $?\times5=15$

New Number Facts

$6\times5=30$ $7\times5=35$ $8\times5=40$ $9\times5=45$
$5\times6=30$ $5\times7=35$ $5\times8=40$ $5\times9=45$
$10\times5=50$ $5\times10=50$

7. How many school days are there in 1 week? in 2 weeks? in 3 weeks? in 4 weeks? in 5 weeks?

8. How many fingers are there on two hands, counting the thumbs? on 4 hands? on 6 hands? on 8 hands?

9. Play a game like that on page 19, using combinations like 6×5 and 8×5.

See page 306.

ORAL EXERCISES

Pieces of money like those shown in the picture are called coins.

1. How many cents are there in a nickel? in a dime?
2. How many cents are there in a quarter? in a half-dollar?
3. Count to 25 by 5's.
4. How many nickels equal a quarter?
5. Count to 50 by 5's. How many nickels equal a half-dollar?
6. Count to 50 by 10's. How many dimes equal a half-dollar?

5 **cents** = one **nickel.**
10 cents = one **dime.**
25 cents = one **quarter.**
50 cents = a **half-dollar.**

5 nickels = one quarter.
5 dimes = a half-dollar.
10 dimes = one **dollar.**
4 quarters = one dollar.

7. Count to 100 by 10's.
8. How many dimes equal a dollar?
9. How many nickels equal 15 cents? 25 cents? 20 cents? 30 cents? 35 cents? 40 cents? 50 cents?

See page 306.

Play that the teacher or some child is a storekeeper, and that each child buys things. Use play money or cut out pieces of paper and mark them.

ORAL EXERCISES

1. Mary bought a bunch of lettuce for 7 cents and paid with a dime. What was her change?

2. Jane bought a loaf of stale bread for 4 cents and paid with a dime. What was her change?

3. John bought a loaf of fresh bread and used a dime to pay for it. How much did the bread cost if his change was 5 cents?

4. Harry bought a box of berries for 12 cents and gave the storekeeper 15 cents. What was his change?

5. Tell number stories about things you could buy at a store and the change you would get.

6. Tom bought a dozen bananas for 20 cents and a dozen oranges for 30 cents. How much did he pay for them?

7. Henry bought a dozen eggs for 35 cents and paid for them in nickels. How many nickels did he use?

8. What things could you buy at a real store for 10 cents? For 15 cents?

9. Tell what coins you could use to pay 35 cents at the store.

10. Tell what coins you could use to pay 43 cents at the store.

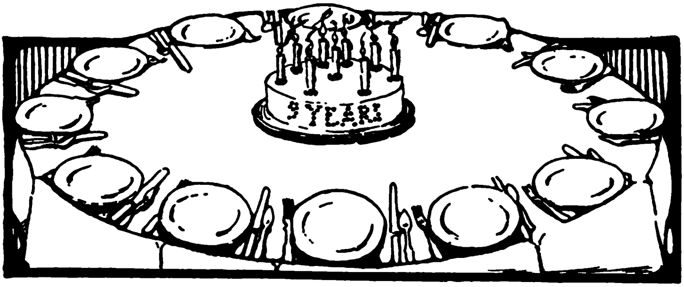
11. Tell number stories about buying things at a store and the coins you could use in paying for them.

See page 306.

ORAL EXERCISES

1. This farmer lived 6 miles from town. How far did he drive going to town and back again?

2. In town the farmer and his three children went to see a ball game and paid 25 cents apiece to get in. How much did it cost them to see the game?



While they were gone the farmer's wife had prepared a surprise for John. The children of two neighbors had been invited for dinner.

3. How many places are set at the table? How many were needed by the farmer's family? How many neighbors' children were invited?

4. John thinks he will graduate from the grammar school when he is 14 years old. How many years has he still to be in grammar school? In what grade do you think he is?

5. Tell other stories about John's birthday.

ORAL EXERCISES

1. Make marks or count splints to find 8+7.

2. In the same way find 9+6, 9+7, and 8+8.

New Number Facts
8+7=15, 9+6=15, 9+7=16, 8+8=16.

Read the sums of the following. Notice that 7+0=7, 6+0=6, and so on.

3.	8	7	9	6	9	8	7	5	3	5
	7	8	6	9	5	5	0	9	8	8
4.	7	7	5	6	7	0	8	6	0	2
	5	0	7	7	7	6	8	5	7	9
5.	9	7	8	8	4	8	7	6	9	7
	7	9	0	3	7	6	6	8	0	3
6.	8	9	4	0	9	0	9	4	7	5
	4	3	8	9	4	5	7	9	4	6

Subtract:

7.	16	16	15	15	15	15	14	14
	9	7	8	7	9	6	9	5
8.	14	14	13	13	13	13	13	13
	8	6	9	4	8	5	7	6
9.	14	12	12	12	12	12	12	12
	7	6	8	3	5	7	4	9

10. Play a game using the new number facts given on this page.

See page 307.

ORAL EXERCISES

1. How many inches are there in one foot? In 2 feet? In 3 feet? How many feet are there in one yard?

2. Do you think your desk is more or less than one foot wide? More or less than 2 feet wide? More or less than 3 feet wide? Measure to see whether your estimate is right.

> Three feet = one **yard.** (3 ft. = 1 yd.)

Instead of yard or yards we often write yd.

3. Estimate in feet the height of the teacher's desk. Make your estimate this way: "It is more than 2 feet and less than 3 feet." Then measure to see if you are right.

4. Estimate in feet the height from the floor to the lower edge of the blackboard. Also estimate the height of the blackboard from the lower to the upper edge.

5. How tall are you? Estimate in feet the height of your teacher.

6. Is the schoolroom more or less than 5 yards wide? 8 yards? 10 yards? 12 yards? 15 yards? Test by measuring.

7. Estimate the length of your schoolroom. Which is harder to estimate, the length or the width of the room?

8. Estimate the width of the teacher's desk, also the width of a chair and of a bookcase in the schoolroom.

9. Estimate the height and width in feet of the schoolroom door; also of a window in the schoolroom.

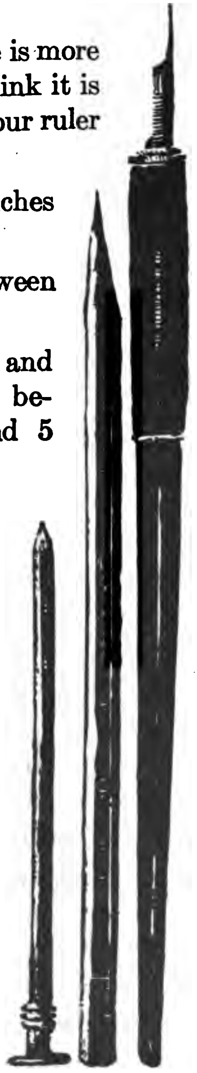
10. Play the game on page 27, using feet in estimating.

ORAL EXERCISES

1. Do you think the penholder in the picture is more or less than 4 inches long? Do you think it is more or less than 10 inches long? Use your ruler to find out.
2. Is the penholder more or less than 5 inches long? more or less than 6 inches?
3. Is it between 5 inches and 6 inches? between 6 inches and 7 inches?
4. Is the length of the lead pencil between 2 and 7 inches? between 6 and 7 inches? between 4 and 6 inches? between 4 and 5 inches?
5. Estimate the length of the nail. Try to estimate within an inch.
6. Estimate within an inch the length of a full line in this book.
7. Estimate within an inch the distance from the first line on this page to the last line.
8. Estimate within an inch the length and the width of the cover of this book.

Play the following game: Some of the children go to the board and each draws a line as nearly one foot long as he can. Then each one measures to see how nearly right he is. The child who is farthest from right must sit down, while someone else takes his place.

Play the same game, drawing a line 6 in. long, 2 ft. long, 18 in. long.



See page 307.

In Examples 1 to 4 below are contained all the multiplication facts learned thus far.

ORAL EXERCISES

Multiply:

1.	2	4	5	4	7	5	2	5	2	3
	4	2	4	5	5	7	5	2	2	3
2.	5	3	2	3	3	4	2	10	5	10
	3	5	3	2	4	3	10	2	10	5
3.	2	6	5	6	5	2	7	8	5	2
	6	2	6	5	5	7	2	5	8	1
4.	2	8	5	9	9	2	5	1	3	1
	8	2	9	5	2	9	1	4	1	1

Practice on these until you can give each one instantly. If any of these cause you trouble write them down and practice on them till you know them well.

WRITTEN EXERCISES

1. Copy and supply the missing numbers:

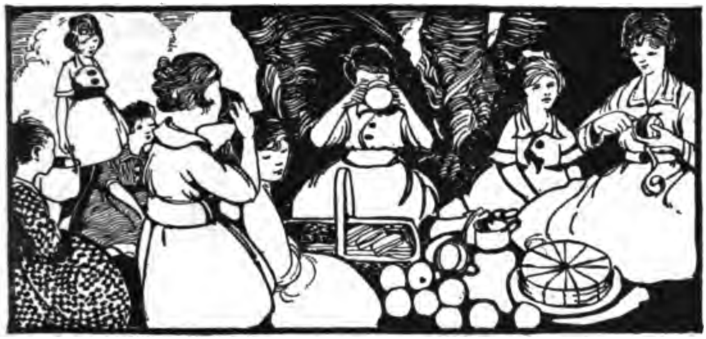
$7 \times ? = 35$ $2 \times ? = 6$ $3 \times ? = 15$ $2 \times ? = 4$
$5 \times ? = 10$ $4 \times ? = 20$ $3 \times ? = 6$ $3 \times ? = 9$
$9 \times ? = 18$ $6 \times ? = 30$ $6 \times ? = 12$ $2 \times ? = 10$
$5 \times ? = 35$ $10 \times ? = 40$ $5 \times ? = 15$ $3 \times ? = 12$

2. Copy and supply the missing numbers:

$? \times 5 = 25$ $? \times 2 = 16$ $? \times 5 = 10$ $? \times 3 = 9$
$? \times 2 = 4$ $? \times 5 = 15$ $? \times 2 = 6$ $? \times 2 = 12$
$? \times 5 = 30$ $? \times 5 = 45$ $? \times 2 = 8$ $? \times 2 = 14$
$? \times 5 = 40$ $? \times 5 = 20$ $? \times 3 = 6$ $? \times 5 = 35$

Play a number game like the one on page 19, using number combinations like those above.

See page 308.



ORAL EXERCISES

1. How many children are there in this party?

2. Mary brought 2 sandwiches for each of the 8 people of the party. How many did she bring?

3. They cut the cake into 12 pieces and each ate one piece. How many pieces were left?

4. Jane bought 8 oranges at 5 cents apiece. How much did she pay for them?

5. One lemon made enough lemonade for 2 persons. How many lemons were needed for the party?

6. At two lemons for 3 cents, how much did 4 lemons cost?

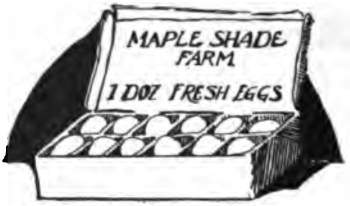
7. The girls started for their picnic at 3 o'clock and returned at 7 o'clock. How many hours were they gone?

8. Going out they rode 4 miles on the street car and then walked 1 mile. How many miles from home was the picnic? How many miles did they ride on the car going and coming? How many miles did they walk?

9. If the fare one way was 5 cents, how much carfare did each one pay? How much carfare did they all pay?

See page 308.

Twelve of anything is called a **dozen.**



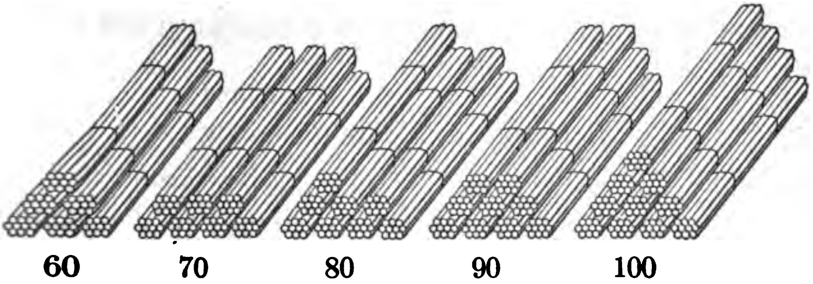
ORAL EXERCISES

1. How many inches are there in one foot? Is this more or less than a dozen?
2. How many cents are there in a dime? Is this more or less than a dozen? how much?
3. How many stripes are there on the U. S. flag? Is this more or less than a dozen? how much?
4. If your mother buys a half-dozen eggs, how many eggs does she buy?
5. There are a dozen buttons on a card. If your mother uses half of them, how many are left?
6. How many are there in 1/3 of a dozen? In 1/4 of a dozen?
7. Which is more, 1/2 of a dozen or 1/3 of a dozen? 1/3 of a dozen or 1/4 of a dozen?
8. Can you divide 12 into 6 equal groups? How many are there in each group?

One of the six equal parts of anything is called **one-sixth** of the thing. One-sixth is written 1/6 or $\frac{1}{6}$.

9. How many are there in 1/6 of 12? Is this more or less than 1/4 of 12? how much?

See page 309.

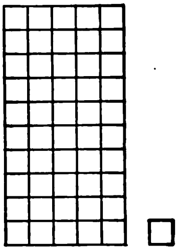


ORAL AND WRITTEN EXERCISES

1. Count to 100 by 10's.
2. Count from 50 to 60 and draw a figure for the number 58. Write the numbers. (See figure below.)
3. The number 52 means 5 *tens* and 2 *ones*. Tell what each of these numbers means: 53, 54, 55, 56, 57, 58, 59.

In numbers like these the first figure to the right stands for *ones* and the next figure stands for *tens*.

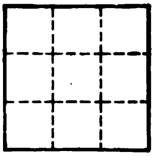
> The first place to the right is called **one's place**, and the second is called **ten's place**.
>
> Since 0 means **not any**, 50 stands for 5 tens and no ones.



$50 + 1 = 51$

4. Count from 60 to 70 and write the numbers.
5. Count from 70 to 80 and write the numbers.
6. Count from 80 to 90 and write the numbers.
7. Count from 90 to 100 and write the numbers.
8. How many tens are there in 60? In 70? In 80? In 90? In 100? How many ones are there in each of these?
9. Count from 50 to 100 by 5's.

See page 309.

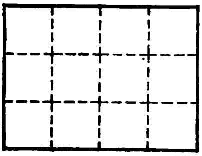


Take a paper 3 inches square and fold it as shown in this figure.

ORAL EXERCISES

1. How many 3's are there in 9?
2. Show ⅓ of 9. ⅓ of 9 is how many?

Notice that if there are three 3's in 9, then ⅓ of 9 must be 3. Hence, from 3×3=9 we know that ⅓ of 9=3.



Take a paper 3 inches by 4 inches and fold it as shown in this figure.

3. How many 3's are there in 12? Show ¼ of 12.
4. How many 4's are there in 12? Show ⅓ of 12.

From 3×4=12 we know that there are three 4's in 12, and also that there are four 3's in 12. We also know from 3×4=12 that ⅓ of 12=4, and ¼ of 12=3. Understanding this will save you a lot of trouble in arithmetic.

WRITTEN EXERCISES

1. Copy the following and supply the missing numbers:

2×3=?
½ of 6=?
⅓ of 6=?

3×4=?
⅓ of 12=?
¼ of 12=?

3×5=?
⅓ of 15=?
⅕ of 15=?

2×4=?
½ of 8=?
¼ of 8=?

2×5=?
½ of 10=?
⅕ of 10=?

2×6=?
½ of 12=?
⅙ of 12=?

2. 1 is ½ of ? 1 is ⅓ of ? 1 is ¼ of ? 1 is ⅕ of ?
3. 2 is ½ of ? 2 is ⅓ of ? 2 is ¼ of ? 2 is ⅕ of ?
4. 3 is ½ of ? 3 is ⅓ of ? 3 is ¼ of ? 3 is ⅕ of ?
5. 4 is ½ of ? 4 is ⅓ of ? 5 is ½ of ? 5 is ⅓ of ?

See page 309.

You found on page 52 that one-third of 9 equals 3. Hence two-thirds of 9 equal 6.

ORAL EXERCISES

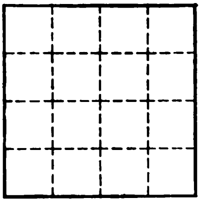
1. In the first figure on page 52 show two-thirds of 9.
2. In the second figure on page 52 show two-thirds of 12.
3. Two-fourths of 12 are how many? Is this more or less than ½ of 12?
4. Show three-fourths of 12.

Two-thirds is written ⅔ or $\frac{2}{3}$.
Three-fourths is written ¾ or $\frac{3}{4}$.

5. ¾ of 12 are how many?

FOLDING PAPER AND DRAWING FIGURES

Fold a piece of paper as shown in the figure.



1. Four 4's are how many?
   This we write $4 \times 4 = 16$.
2. One-fourth of 16 is how many?
3. Two-fourths of 16 are how many?
4. ½ of 16 is how many? Which is more, ½ of 16 or ¼ of 16?
5. Supply the missing numbers in ½ of 16 = ?; ¼ of 16 = ?; $4 \times 4 = ?$.
6. Draw a figure 5 inches long and 3 inches wide and divide it into square inches. How many square inches are there in the figure?
7. ⅓ of 15 is how many? ⅕ of 15 is how many? In your figure show ⅔ of 15; also ⅖ of 15; ⅗ of 15; ⅘ of 15.
8. Play a game finding parts of numbers.

See page 310.

ORAL EXERCISES

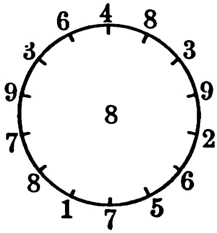
1. Find the sum of 8 and 9 and of 9 and 9. All the combinations given below have been studied before except 9+8 and 9+9.

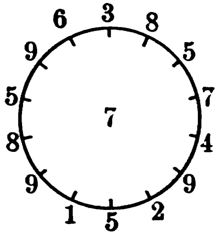
New Number Facts
$9+8=17$
$9+9=18$

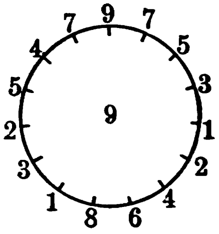
Read rapidly, giving the sums:

2.	3	4	5	6	7	8	9	3	4	5
	5	5	3	5	3	3	2	7	7	4
3.	6	7	8	9	3	4	5	6	7	8
	7	4	4	3	8	8	6	8	5	5
4.	9	3	5	6	7	8	9	5	7	8
	4	9	7	9	6	6	5	8	7	7
5.	9	5	7	8	9	7	8	9	9	4
	6	9	8	8	7	9	9	8	9	9

6. In each of these circles add the numbers outside it to the number within it. See how rapidly you can go around each circle.







7. Play the number game on page 19, adding numbers.

8. Give the sums in exercises 2 to 5 again. Make a list of those that cause you trouble, and practice on them till you know them well.

See page 310

ORAL EXERCISES

1. Harry and Jennie live 7 blocks from school. How many blocks do they walk going to school and back?

2. They start from home 15 minutes before the last bell rings. It takes them 10 minutes to walk to school. How many minutes have they to spare?

3. School closes at 12 o'clock. At what time do they get home for lunch, if they walk the distance in 10 minutes?

4. On rainy days they ride on the street car. Each pays 5 cents car-fare. How much money do they need for car-fare if they ride both ways?

They can buy things to eat at the school cafeteria at these prices:

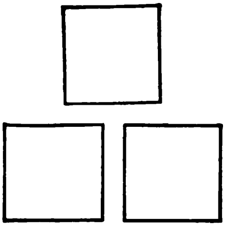
Cream of wheat and milk	3¢
Soup	2¢
Glass of milk	3¢
Bread and butter	2¢
Sandwich	3¢
Cookies	1¢
Stewed fruit	2¢

5. Plan some lunches for them and tell what these lunches would cost.

6. If Jennie spent 7 cents for lunch, how much money did she spend for lunch and car-fare together?

7. Tell number stories about buying lunch at school.

See page 312.



ORAL EXERCISES

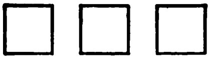
1. Make a figure like this with sticks. How many sticks do you need to make it? What do you call this figure?

2. How many sticks do you need to make two squares if they do not touch each other?

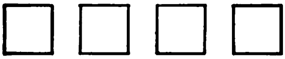
3. Count to 24 by 4's, also by 2's. Does counting by 2's help you to count by 4's? how?

4. Two 4's are how many?

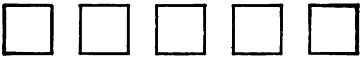
5. Three 4's are how many?



6. Four 4's are how many?



7. Five 4's are how many?



8. Six 4's are how many? Draw six squares and count the sides.

New Number Facts

4×4=16 6×4=24 4×6=24

Learn the new number facts separately so that you can state each one instantly.

WRITTEN EXERCISES

Copy and supply the missing numbers:

2×4=?	3×4=?	5×4=?	6×4=?
4×2=?	4×3=?	4×5=?	4×6=?
½ of 8=?	⅓ of 12=?	⅕ of 20=?	¼ of 24=?
¼ of 8=?	¼ of 12=?	¼ of 20=?	⅙ of 24=?

See page 312.

ORAL EXERCISES

1. Have you seen quart bottles of milk? pint bottles? Which holds more, a quart bottle or a pint bottle?

2. Find out how much one quart of milk costs. At this price, how much will 2 quarts cost?

3. Find out how much one pint of cream costs. Which costs more, a quart of milk or a pint of cream? How much more?

If you can get a quart and a pint measure and some sand, sawdust or beans you can easily find out how many pints there are in a quart by filling the pint measure and pouring it into the quart measure.

4. How many pints are there in one quart? One pint is what part of a quart?

5. How many pints are there in 2 quarts? in 4 quarts? in 6 quarts?

6. How many quart measures may be filled from 8 pint measures? from 10 pint measures?

> **2 pints** = **1 quart** (2 pt. = 1 qt.).
> One pint is enough to fill two glasses.

We sometimes write pt. for pint or pints and qt. for quart or quarts.

7. How many glasses can be filled from one quart bottle? from 2 quart bottles? from 3 quart bottles?

See page 312.

ORAL EXERCISES

Add:

1.	9	7	5	6	5	6	4	3	8	8
	9	5	6	6	7	5	8	8	4	3
2.	9	9	9	8	7	6	8	9	7	5
	8	7	6	9	9	9	7	5	8	9
3.	8	4	9	5	6	6	8	8	7	7
	8	9	4	8	7	8	5	6	6	7

$$\boxed{\begin{array}{r}4\\5\\\underline{2}\\11\end{array}}$$

When more than two numbers are to be added, first add two of them, then add the third to this sum, and so on. Thus, in the example at the right, we add 4 and 5 and then add 2 to the sum. Say simply 4, 9, 11.

To make sure that the sum is correct add again and in the opposite direction. That is, add 2 and 5 and then add 4 to the sum. This is called checking. First add downward, and then add upward to check.

WRITTEN EXERCISES

Copy and add. First add downward. Then check each sum by adding upward. Adding 0 is the same as not adding any.

1.	4	3	6	4	3	6	7	0	6	5
	2	5	0	4	4	1	2	2	2	4
	6	4	4	5	4	7	6	3	5	5
2.	3	6	4	5	7	6	5	7	6	4
	4	1	4	3	2	2	4	2	3	3
	3	2	4	6	4	7	3	5	4	6
3.	3	6	5	5	5	3	8	4	4	5
	3	3	4	3	3	6	1	2	2	2
	4	3	3	3	6	3	7	7	3	6

See page 313.

In subtracting 7 from 12 we say either "12 less 7 is 5" or "12=7+5", and write 5 below the line. Your teacher will choose one of these ways for you, and then you must always subtract that way.

$$\boxed{\begin{array}{r}12\\7\\\hline 5\end{array}}$$

ORAL EXERCISES

Subtract:

1.	17	17	18	16	16	16	15	15
	9	8	9	8	9	7	9	6

2.	15	15	14	14	14	14	14	12
	8	7	9	5	8	6	7	6

3.	13	13	13	13	13	13	12	12
	9	4	8	5	7	6	7	5

4.	12	12	11	11	11	11	11	11
	9	8	7	9	4	3	5	6

WRITTEN EXERCISES

Copy and add. Check as on page 58.

1.	3	2	6	5	4	3	5	2	3	3
	4	3	2	4	4	3	4	6	6	5
	5	4	3	3	5	6	5	3	2	4

2.	4	7	6	5	3	4	2	7	8	8
	5	2	3	4	4	4	4	1	1	1
	3	6	5	4	5	3	5	8	5	6

3.	7	7	5	6	4	5	6	4	4	3
	2	2	1	1	2	2	2	4	3	6
	5	7	8	5	6	4	6	5	5	3

4.	4	5	4	6	5	4	8	0	6	5
	5	2	3	3	4	5	6	5	3	0
	4	7	6	6	2	3	0	9	5	8

See page 313

ORAL EXERCISES

1. Name the days of the week. Which is the first day and which is the last?
2. How many days are there in a week?
3. How many days do you go to school each week?
4. How many days are there in two weeks?
5. How many days do you go to school in 2 weeks? in 3 weeks? in 4 weeks?
6. How many days does John's father work each week?

7 days = 1 week. (7 da. = 1 wk.)

We sometimes write da. for day or days, and wk. for week or weeks.

7. How many days does John's father work in two weeks? How can you find how many days he works in 3 weeks?

Read rapidly the sums of the following:

8.	7	8	8	4	6	5	9	5	7	8
	5	5	7	5	7	8	7	7	8	8
9.	9	7	9	7	8	8	4	8	5	9
	9	9	8	6	5	9	9	3	9	4

Subtract the following:

10.	14	15	13	16	14	15	15	13
	5	7	6	9	6	8	9	7
11.	15	17	16	16	18	17	14	14
	6	9	7	8	9	8	8	9
12.	14	12	13	14	12	13	14	13
	5	8	4	6	7	5	7	8

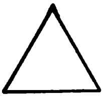
See page 313.

ORAL EXERCISES

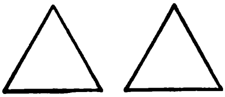
1. Read and supply the missing numbers:

$2 \times 3 = ?$ $3 \times 3 = ?$ $4 \times 3 = ?$

2. Make a figure like this with sticks. How many sticks do you use to make it? What do you call the figure?

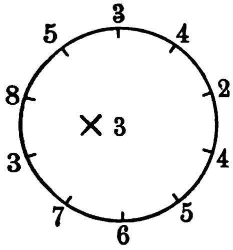


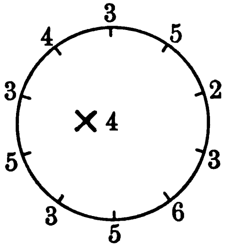
3. How many sticks do you need to make two triangles if they do not touch each other? How many do you need to make three triangles? four triangles? five triangles? six triangles? seven triangles? eight triangles?

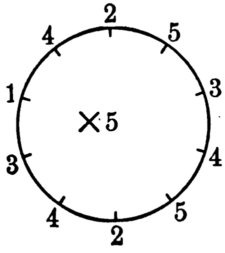


4. Five 3's make how many? six 3's? seven 3's? eight 3's?

See how rapidly you can go around these circles.







WRITTEN EXERCISES

Copy and supply the missing numbers in the following:

$6 \times 3 = ?$ $7 \times 3 = ?$ $8 \times 3 = ?$

$\frac{1}{6}$ of $18 = ?$ $\frac{1}{7}$ of $21 = ?$ $\frac{1}{8}$ of $24 = ?$

$\frac{1}{3}$ of $18 = ?$ $\frac{1}{3}$ of $21 = ?$ $\frac{1}{3}$ of $24 = ?$

New Number Facts

$6 \times 3 = 18$ $7 \times 3 = 21$ $8 \times 3 = 24$

$3 \times 6 = 18$ $3 \times 7 = 21$ $3 \times 8 = 24$

See page 314.

1. What do the letters on the face of this clock mean? Ask the teacher if you are right. Such letters, when used for numbers, are called Roman numerals.

2. Write the Roman numerals I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII.

I means 1
II means 2
III means 3
IV means 4
V means 5
VI means 6
VII means 7
VIII means 8
IX means 9
X means 10
XI means 11
XII means 12

On the clock IIII is often used instead of IV.

3. Where else have you seen V used for 5, and X for 10?

4. What are the small spaces on the clock called? If you do not know ask the teacher or someone else to tell you.

5. How many minute spaces are there between the numbers I and II? between II and III? between III and IV? between XII and IV?

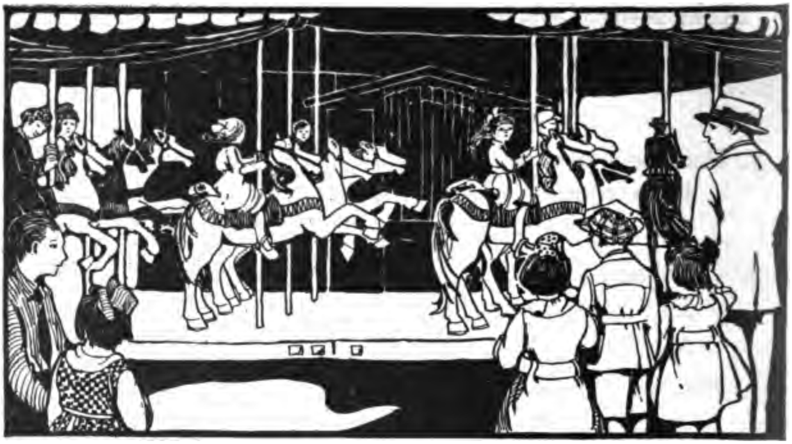
See page 314.

Make a toy clock face and fasten hands on it with a pin. The long hand of the clock is the *minute hand;* the short hand is the *hour hand.*

PROBLEMS

1. Set the clock so that it shall read 12 o'clock. If you have trouble the teacher or some one at home will help you set your clock.
2. At what time do you leave home for school in the morning? Set the toy clock so that it will show the time at which you leave home.
3. Set the clock to show the time at which you came to the school-house this morning.
4. Set the clock to show the time at which school is called to order in the morning.
5. When do you have your first recess? Set your clock to show that time.
6. Set your clock to show the time when school is out in the afternoon.
7. How many minutes are there in one hour?
8. How many minutes are there in half an hour? In a quarter of an hour?
9. How many minutes does it take you to go to school in the morning?
10. How long does it take you to brush your teeth well? to wash your face and hands? to put on your shoes?
11. How many minute spaces are there between XII and VI? Count to 30 by 5's.
12. How many minute spaces are there all around the face of the clock? Count them. Count to 60 by 5's.

See page 314.



ORAL EXERCISES

1. How many children can you see riding on this merry-go-round?

2. These children pay five cents for each ride. How much do 7 children pay?

3. The children standing with their father are going to ride next. How much will the father have to pay for the three children? What change will he get from a quarter?

4. How much is paid for 5 rides? for 6 rides? for 7 rides? for 8 rides? for 9 rides?

5. How many children can ride for 25 cents? for 30 cents? for 35 cents? for 40 cents? for 45 cents? for 50 cents? for 20 cents? for 15 cents?

6. A man pays for 4 rides for his children. What change will he get from a quarter?

7. A lady pays for 8 rides for some children. What change does she get from a half-dollar?

See page 315.

ORAL EXERCISES

Read and supply the missing numbers:

1.	2×5=?	½ of 10=?	6×5=?	⅙ of 30=?
	3×5=?	⅓ of 15=?	7×5=?	⅐ of 35=?
	4×5=?	¼ of 20=?	8×5=?	⅛ of 40=?
	5×5=?	⅕ of 25=?	9×5=?	⅑ of 45=?

Subtract:

2.	8	6	6	7	7	9	9	8	10	9
	3	4	2	2	5	4	6	2	6	5

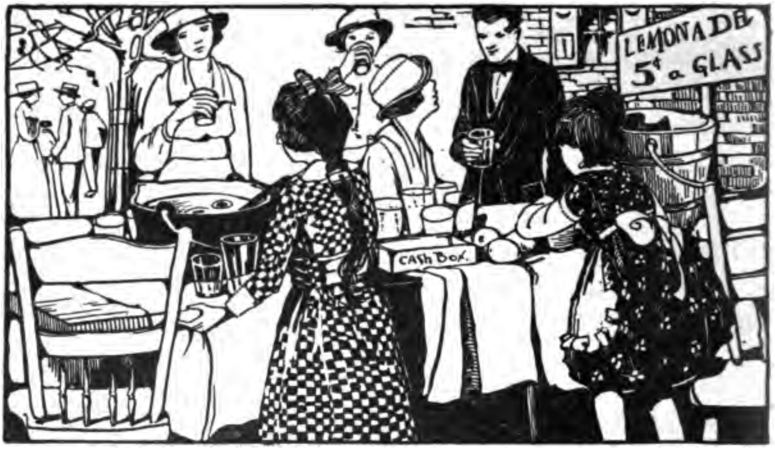
3.	18	17	17	16	16	16	15	15	15
	9	8	9	7	9	8	6	9	8
4.	14	13	15	14	13	13	12	12	11
	6	8	8	8	7	9	7	9	7
5.	11	9	8	11	12	11	12	9	11
	9	7	5	5	5	8	8	5	3

WRITTEN EXERCISES

Copy and add:

1.	3	4	6	7	3	5	5	4	5	2	5
	2	2	3	2	5	4	2	3	0	3	3
	7	6	5	5	4	5	7	6	9	4	2
2.	3	0	2	5	5	4	2	0	3	8	6
	4	9	7	2	4	4	3	7	2	7	3
	5	4	1	3	2	5	4	3	1	0	5
3.	5	7	6	7	4	7	8	2	3	8	5
	3	2	3	0	2	2	0	5	4	0	4
	4	5	6	9	3	2	9	3	3	9	3

See page 315.



ORAL EXERCISES

1. How many people are drinking lemonade?

2. These girls get 5 cents a glass for the lemonade. How much do they get for 4 glasses? What change do the girls give for a quarter?

3. How many glasses of lemonade would these girls sell for a dime? for 2 dimes? for 3 dimes? for 4 dimes? for 5 dimes? for 6 dimes? for 7 dimes? for 8 dimes? for 9 dimes? for 10 dimes?

4. What is the cost of 5 glasses of lemonade? of 6 glasses? of 7 glasses? of 8 glasses? of 9 glasses? of 10 glasses?

5. How much will the girls get for 20 glasses of lemonade? How many 5's are there in 100? Count to 100 by 5's.

6. How many glasses of lemonade would these girls have to sell to get a quarter? a half-dollar? a dollar?

7. If the girls sell three glasses of lemonade what change do they give for a quarter?

See page 315.

The girls bought the lemons for the lemonade, and one girl's mother gave them the sugar.

Two lemons cost 5 cents.
One lemon makes 2 glasses of lemonade.

ORAL EXERCISES

1. How much would the girls pay for 4 lemons? for 6 lemons? for 8 lemons?

2. How many glasses of lemonade do they get from 2 lemons? from 3 lemons? from 4 lemons? from 6 lemons? from 8 lemons?

3. How much does it cost the girls to make 4 glasses? 8 glasses? 12 glasses?

4. How much more did the girls get for 4 glasses of lemonade than it cost them?

5. Tell number stories about selling lemonade.

WRITTEN EXERCISES

Copy and subtract:

6.	14	11	12	17	14	15	18	16	17
	5	4	3	8	8	9	9	9	9
7.	14	15	12	13	11	11	15	16	16
	7	6	6	7	5	6	8	7	8
8.	11	11	11	12	11	12	13	13	14
	7	9	8	9	3	7	8	6	5
9.	12	12	12	12	12	14	14	13	14
	5	6	8	7	4	6	9	9	8

Play a game, using examples in subtraction.

See page 315.

9 : 00– 9 : 10 Opening Exercises
9 : 10– 9 : 25 Language
9 : 25– 9 : 35 Phonetics
9 : 35– 9 : 55 Seatwork
9 : 55–10 : 05 Physical Exercises
10 : 05–10 : 25 Reading
10 : 25–10 : 45 Recess
10 : 45–10 : 55 Story
10 : 55–11 : 10 Number
11 : 10–11 : 30 Seatwork

1 : 30–1 : 45 Music
1 : 45–2 : 00 Writing
2 : 00–2 : 20 Seatwork
2 : 20–2 : 30 Spelling
3 : 30–2 : 45 Recess
2 : 45–3 : 00 Reading
3: 00–3 : 20 Drawing and Handwork
3 : 20–3 : 30 Games and Songs.

ORAL EXERCISES

1. Set your toy clock face (see page 63) to show each hour given in this program.

   We write 9:00 for nine o'clock, 9:10 for ten minutes past nine, 9:45 for forty-five minutes past nine, and so on. 9:45 is also read "a quarter to ten." 9:50 is usually read "ten minutes to ten," and 9:55 is usually read "five minutes to ten." Sometimes 9.00, 9.10 are written for 9:00, 9:10. Either form may be used.

2. Read this program. What time of day is 10:58?
3. How many minutes are spent on language in this program?
4. How many minutes are spent for recess?
5. How many minutes are given to reading in the morning?
6. How many minutes are spent on spelling?
7. Set your toy clock to show each hour named in your school program.
8. Write the following by means of figures: twenty-five minutes past ten; half-past ten; five minutes to eleven (this is fifty-five minutes past ten).

See page 316.

If you have done your work well you should be able to read the drills on this page and the next, giving the results without hesitation and without making a single mistake.

ORAL EXERCISES

Give the sums of the following in 3 minutes or less:

3 9	7 4	5 6	9 9	9 2	8 7	9 5	4 5	6 3	8 5
5 7	9 6	2 5	5 9	6 4	3 8	7 2	7 4	8 9	7 7
9 8	9 4	4 7	4 3	6 8	9 3	7 8	2 8	6 2	3 6
8 9	5 7	6 5	8 7	7 6	2 7	3 4	7 8	3 2	5 4
8 5	4 6	9 4	6 8	9 8	6 9	9 5	4 8	5 2	7 3
2 9	9 4	7 9	7 5	6 8	8 4	2 4	5 4	7 5	8 9
6 6	2 8	8 3	3 9	9 6	4 9	7 6	8 7	7 9	5 3
9 7	5 9	6 9	5 8	3 5	7 9	6 7	8 3	3 7	5 8
9 8	6 9	8 6	4 8	7 6	2 7	5 9	9 7	8 8	6 5
5 4 3	7 2 6	9 0 7	3 6 5	2 7 4	3 5 4	1 7 2	4 2 7	5 0 9	0 8 7

See page 316.

ORAL EXERCISES

Give the products of the following:

3	4	6	7	8	2	9	2	2	6
5	3	2	5	3	4	2	3	5	4
6	5	8	5	8	4	3	3	3	5
5	2	5	3	2	4	3	2	3	4
9	4	10	5	10	7	6	3	4	5
5	2	2	5	5	2	5	1	1	1

Give the missing numbers in the following:

½ of 4 = ?
⅐ of 14 = ?
¼ of 12 = ?
⅕ of 20 = ?
⅙ of 24 = ?
⅕ of 15 = ?
⅛ of 16 = ?
⅓ of 6 = ?
½ of 6 = ?
⅑ of 18 = ?
⅙ of 18 = ?

⅕ of 10 = ?
⅕ of 15 = ?
⅙ of 30 = ?
⅐ of 21 = ?
⅒ of 20 = ?
¼ of 8 = ?
⅕ of 10 = ?
⅓ of 9 = ?
⅛ of 24 = ?
⅕ of 20 = ?
⅕ of 25 = ?

¼ of 8 = ?
⅓ of 12 = ?
½ of 10 = ?
⅙ of 12 = ?
⅓ of 15 = ?
¼ of 12 = ?
⅕ of 30 = ?
⅕ of 35 = ?
¼ of 16 = ?
⅓ of 18 = ?
½ of 12 = ?

½ of 14 = ?
⅓ of 21 = ?
¼ of 20 = ?
⅕ of 40 = ?
⅕ of 45 = ?
¼ of 24 = ?
⅓ of 24 = ?
½ of 16 = ?
½ of 18 = ?
⅕ of 50 = ?
½ of 20 = ?

1 nickel = ? cents
1 dime = ? cents
1 quarter = ? cents
1 half-dollar = ? cents
1 dollar = ? cents
1 quarter = ? nickels
1 half-dollar = ? nickels
1 half-dollar = ? dimes
1 dollar = ? dimes

1 foot = ? inches
1 yard = ? feet

1 quart = ? pints

1 week = ? days
1 hour = ? minutes

e 316.

CHAPTER II

A NUMBER GAME

These children are playing a number game. Each child has pencil and paper. The teacher reads number combinations like $7+8=?$ and $6+5=?$. The children write the sums. When the teacher has finished reading, the children exchange papers and the teacher reads the answers. The pupils mark the wrong answers and then count the wrong answers and those not given. One side of the room plays against the other side. The side which has the fewer mistakes wins. The girls may also play against the boys.

ORAL EXERCISES

Read rapidly and supply the missing numbers:

1. $9+8=?$ $7+8=?$ $9+7=?$ $9+6=?$
2. $7+6=?$ $8+5=?$ $8+6=?$ $6+5=?$
3. $6+9=?$ $7+9=?$ $8+7=?$ $8+9=?$
4. $5+6=?$ $6+8=?$ $5+8=?$ $6+7=?$

See page 316.

From 3+5=8 you should see at once that 13+5=18, 43+5=48, etc.

3	13	43
5	5	5
8	18	48

ORAL EXERCISES

Add:

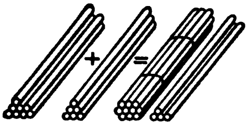
1.	2	12	22	32	42	52	62	72	82
	3	3	3	3	3	3	3	3	3
2.	3	13	23	33	43	53	63	73	83
	4	4	4	4	4	4	4	4	4
3.	3	13	23	33	43	53	63	73	83
	5	5	5	5	5	5	5	5	5
4.	5	15	25	35	45	55	65	75	85
	4	4	4	4	4	4	4	4	4
5.	6	16	26	36	46	56	66	76	86
	3	3	3	3	3	3	3	3	3

WRITTEN EXERCISES

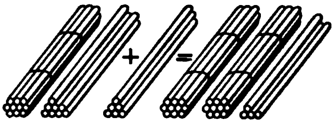
Copy and Add:

1.	12	23	45	22	34	42	54	82	93
	7	6	4	6	4	5	5	7	4
2.	43	24	81	72	62	55	64	27	72
	6	3	7	7	5	4	5	2	4
3.	15	25	43	51	72	84	62	54	31
	2	3	6	8	6	4	3	4	5
4.	36	43	68	52	73	84	81	53	73
	3	5	1	7	5	5	7	6	6
5.	85	57	24	65	75	43	53	63	25
	3	2	3	3	2	6	3	4	3

See page 319.



8 + 6 = 14



18 + 6 = 24

WRITTEN EXERCISES

Arrange splints or toothpicks as above or make marks to show the sums of the following:

1.	6	16	8	18	4	14	7	17	4	14
	7	7	9	9	8	8	5	5	9	9

Copy the numbers below and add. If you have trouble in finding the sums, use splints or make marks.

2.	9	19	9	19	9	19	9	19	9	19
	7	7	6	6	9	9	8	8	3	3
3.	8	18	8	18	8	18	8	18	4	14
	8	8	5	5	9	9	7	7	9	9
4.	7	17	7	17	7	17	7	17	5	15
	9	9	8	8	7	7	6	6	9	9

ORAL EXERCISES

Add:

1.	6	16	6	16	6	16	6	16	6	16
	9	9	8	8	7	7	5	5	6	6
2.	5	15	8	18	5	15	5	15	9	19
	9	9	6	6	8	8	6	6	2	2
3.	2	12	8	18	7	17	3	13	4	14
	9	9	3	3	4	4	8	8	7	7

See page 319.

ORAL EXERCISES

1. Add 2 to each number in the following table:

0	10	20	30	40	50	60	70	80	90
1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99

2. Count to 100 by 2's beginning with 0. Point to the numbers in the above table.

3. Count to 99 by 2's beginning with 1. Point to the numbers. To which lines do you point?

4. Count to 100 by 5's beginning with 5. Point to the numbers in the table? To which lines do you point?

5. Count to 100 by 10's beginning with 0. Count to 95 by 10's beginning with 5. Count to 93 by 10's beginning with 3, and so on. How does the table help you?

Give the following sums rapidly:

6.	8	18	28	38	48	58	68	78	88
	2	2	2	2	2	2	2	2	2
7.	8	18	28	38	48	58	68	78	88
	5	5	5	5	5	5	5	5	5
8.	6	16	26	36	46	56	66	76	86
	9	9	9	9	9	9	9	9	9

See page 320.

Since 9+2=11 you should see at once that 29+2=31, 49+2=51, etc.

9	29	49
2	2	2
11	31	51

ORAL EXERCISES

Add:

1.	9	29	39	49	59	69	79	89	19
	5	5	5	5	5	5	5	5	5
2.	7	17	27	37	47	57	67	77	87
	4	4	4	4	4	4	4	4	4
3.	5	25	35	45	55	65	75	85	15
	6	6	6	6	6	6	6	6	6
4.	7	17	27	37	47	57	67	77	87
	9	9	9	9	9	9	9	9	9

WRITTEN EXERCISES

Copy and Add:

1.	9	29	59	19	89	39	69	49	79
	9	9	9	9	9	9	9	9	9
2.	7	47	17	87	37	77	47	27	57
	8	8	8	8	8	8	8	8	8
3.	8	58	68	18	38	28	88	78	48
	9	9	9	9	9	9	9	9	9
4.	9	19	39	59	29	79	29	89	49
	8	8	8	8	8	8	8	8	8
5.	7	37	17	57	27	77	47	87	67
	6	6	6	6	6	6	6	6	6

See page 320.

ORAL EXERCISES

Add:

1.	8	28	6	36	8	58	9	39	7	37
	5	5	6	6	7	7	3	3	8	8
2.	7	37	7	57	5	65	7	37	8	58
	6	6	7	7	9	9	9	9	9	9
3.	7	47	8	28	8	68	8	68	4	74
	4	4	4	4	8	8	6	6	9	9
4.	5	15	5	35	5	65	5	65	9	39
	6	6	7	7	8	8	9	9	8	8
5.	8	88	8	78	4	64	6	46	9	49
	3	3	9	9	8	8	5	5	6	6

WRITTEN EXERCISES

Copy and add:

1.	9	39	9	69	9	39	9	59	9	79
	9	9	8	8	7	7	6	6	5	5
2.	4	24	9	89	6	76	7	37	6	86
	7	7	4	4	7	7	8	8	9	9
3.	2	42	7	57	6	66	5	75	9	69
	9	9	9	9	8	8	6	6	4	4
4.	6	46	9	39	9	79	5	45	3	53
	9	9	2	2	7	7	8	8	9	9

Play the game on page 71. Let one side of the room play against the other. Use combinations like those given on page 54. The more difficult addition combinations are among these.

See page 320.

In adding a column of figures as at the right add downward. Say 8, 13, 17, 23. Think no other number. Write 23 below the line. Then add upward to make sure you are right. Say 6, 10, 15, 23.

8
5
4
6
23

ORAL EXERCISES

Without copying the figures find the sums and write them on a sheet of paper. Add downward. Then find the sums again by adding upward, and write them on another paper. Compare the two sets of sums. They should be just alike.

1.	4	8	6	7	8	5	3	4	8	7
	3	5	5	9	9	7	5	5	5	5
	7	1	2	4	7	8	2	8	8	7
	6	4	8	6	6	7	7	9	4	3
	20	18	21	26	30	27	17	26	25	22
2.	8	4	5	4	1	2	1	8	1	5
	9	6	6	3	2	3	5	4	9	6
	8	8	7	5	3	5	6	4	8	9
	2	9	8	6	6	2	5	7	7	4
	27	27	26	18	12	12	17	23	25	24

WRITTEN EXERCISES

Copy and add. Check by adding both ways.

1.	3	9	8	7	6	3	4	5	7	8
	8	7	6	7	5	5	6	7	3	5
	7	5	4	8	8	3	4	6	9	1
	9	3	2	8	9	7	8	8	2	7
	27	24	20	30	28	18	22	26	21	21
2.	3	5	6	3	5	3	2	3	7	8
	9	1	5	2	7	9	7	5	5	4
	8	7	7	4	4	4	4	6	3	5
	4	8	9	8	7	8	9	4	7	3
	24	21	27	17	23	24	22	18	22	20

See page 320.

Problem. There are 23 children in one room and 34 in another. How many children are there in both rooms?

To find the number of children in both rooms add 23 and 34.

$$\boxed{\begin{array}{l} 23 = 2 \text{ tens} + 3 \text{ ones} \\ \underline{34} = \underline{3 \text{ tens}} + \underline{4 \text{ ones}} \\ 57 = 5 \text{ tens} + 7 \text{ ones} \end{array}}$$

Write *ones* under *ones* and *tens* under *tens*.

First add the ones, and then the tens.

In adding ones do not say, "3 and 4 are 7," but think rapidly 3, *7*. Write *7* in one's place below the line. In adding tens, think 2, *5*. Write *5*.

$$\boxed{\begin{array}{r} 23 \\ \underline{34} \\ 57 \end{array}}$$

Ones: 3, 7. Write *7*.
Tens: 2, 5. Write *5*.
The sum is 57.

} Short explanation.

WRITTEN EXERCISES

Copy and add:

1.	43	34	52	41	43	35	64	43
	26	45	36	38	54	23	34	54
	69	79	88	79	97	58	98	97
2.	37	53	61	34	15	25	52	43
	42	35	16	53	71	73	45	36
	79	88	77	87	86	98	97	79
3.	73	65	55	54	45	52	47	56
	15	34	43	23	22	42	22	22
	88	99	98	77	67	94	69	78

ORAL EXERCISES

Copy the table on page 74 and paste it on cardboard for use here and later when reference is made to it.

1. Add 4 to each number in the first column of this table, and also to each number in the first three rows.
2. Add 5 to each number in the first column, and also to each number in the first three rows.

See page 320.

Tom has a little bank. He wants to save enough money to buy a pair of skates for 95 cents.

ORAL AND WRITTEN EXERCISES

1. One week he puts into the bank 7 cents and 1 nickel. How many cents is this?
2. The next week he puts in 1 cent, 2 nickels, and 1 dime. How many cents is this?
3. The third week he puts in 2 nickels and 2 cents. How many cents is this?
4. The fourth week he puts in 1 dime, 1 nickel, and 8 cents. How many cents is this?

First week...	12 cents
Second week.	21 cents
Third week..	12 cents
Fourth week.	23 cents

5. How much has Tom in the bank at the end of the fourth week? To find out how much he has, write down the number of cents for each week and add them.
6. The fifth week Tom puts in 4 cents and 1 nickel. He now has 68 cents and 9 cents. How much is this?
7. The sixth week he puts in 1 dime, and 2 cents. How much has he now?

77
12

8. Tom's father gives him a dime to add to his 89 cents. Has he enough money to buy the skates now?
9. After buying the skates, will he have any money left? how much?

See page 320.

Example 1. Add 28 cents and 35 cents.

28 cents =	2 dimes +	8 cents
35 cents =	3 dimes +	5 cents
63 cents	5 dimes	13 cents

First add the cents and then the dimes. 8 cents + 5 cents = 13 cents. 13 cents = 1 dime + 3 cents.

Write 3 in ones' place and add or *carry* the 1 dime to the dimes in the tens' column. 1 dime + 2 dimes + 3 dimes = 6 dimes. Write 6 in tens' place.

Think rapidly: *Ones:* 8, 13. Write *3*, carry 1.
Tens: 1 (carried), 3, 6. Write *6*.
The sum is 63.

Example 2. Add 39, 26 and 19.

39
26
19
84

Write the numbers in a column as shown here.
Ones: Think 9, 15, 24. Write *4*, carry 2 (tens).
Tens: 2 (carried), 5, 7, 8. Write *8*.
The sum is 8 tens and 4 ones, or 84.

WRITTEN EXERCISES

Copy and add:

1.	27	29	54	23	38	34	43	56
	45	47	39	49	46	58	48	38
	72	76	93	72	84	92	91	94
2.	38	46	57	47	54	67	64	72
	54	39	26	38	27	19	29	19
	92	85	83	85	81	86	93	91
3.	13	38	68	44	54	16	25	8
	26	29	7	17	24	29	42	7
	24	17	13	24	17	34	18	61
	63	84	88	85	95	79	85	76
4.	18	41	37	54	57	14	61	79
	24	26	28	26	24	27	17	12
	37	15	14	11	14	39	8	7
	79	82	79	91	95	80	86	98

See page 321

WRITTEN EXERCISES

See how long it takes you to copy and add the following. Remember that the work is worthless unless it is accurate.

1.	45	37	27	32	23	47	28	57
	29	28	49	48	28	19	45	34
	74	65	76	80	51	66	73	91
2.	14	18	15	26	28	18	26	9
	27	13	52	13	39	57	13	4
	41	31	67	39	67	75	39	13
3.	50	34	34	43	37	58	9	7
	5	3	28	19	24	19	39	12
	14	7	8	7	5	7	24	42
	69	44	70	69	66	84	72	61
4.	32	4	7	9	24	53	12	16
	14	19	12	4	19	19	47	5
	17	24	68	14	7	23	16	24
	63	47	87	27	50	95	75	45

ORAL EXERCISES

To find a sum like 47+8 do not add the ones and then carry. Try to think 47+8=55 at once.

In this way add the following:

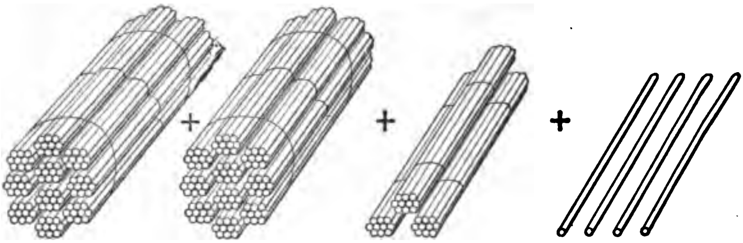
1.	36	18	17	24	35	24	16	15
	7	6	9	7	7	8	7	9
2.	18	19	17	25	27	18	19	16
	7	6	8	6	5	5	7	6
3.	27	24	26	28	25	26	23	28
	8	9	8	8	6	9	8	7
4.	35	77	83	45	64	87	67	37
	9	8	9	7	7	9	9	5

See page 322.

Hundreds, Thousands. Ten 10's are called one *hundred*, written 100. Two 100's are written 200, three 100's are written 300, and so on.

Ten 100's are called one *thousand*, written 1000.

> Beginning with ones' place and counting to the left the third place is called **hundreds' place** and the fourth place is called **thousands' place.**



$$200 + 30 + 4 = 234.$$

In the number 420, there are 4 hundreds, 2 tens, and no ones. It is read four hundred twenty. In the number 507, there are 5 hundreds, no tens and 7 ones. It is read five hundred seven.

ORAL EXERCISES

1. What figure represents ones, what figure represents tens and what figure represents hundreds in 113? in 300? in 530? in 242? in 308? in 460? in 700? in 678?

2. Count by 10's from 100 to 200.

3. Count by ones from 290 to 310.

The number 293 is read two hundred ninety-three, *not* two hundred *and* ninety-three.

4. Read the following numbers: 361, 475, 952, 259, 163, 613, 473, 829, 982, 298, 567.

See page 322.

WRITTEN AND ORAL EXERCISES

1. Write the following numbers, using figures:

Three hundred thirty-six
Five hundred sixty-nine
Seven hundred sixty-two
Six hundred thirty-one
Nine hundred seventy-eight
Four hundred eight
Eight hundred forty-two
One hundred one
Four hundred seventy-three
Eight hundred thirty-five
Nine hundred fifty-seven
Two hundred ninety-eight
One hundred ten
Three hundred sixty
Four hundred sixteen
Seven hundred nine

2. How many days are there in a year? If you do not know ask the teacher or your parents. Write this number and read it.

3. How many children are there in your school? The teacher will be able to tell you just about how many there are. Write this number and read it. Is this more or less than 100? Is it more or less than 1000?

4. Read the following sentences: "The Woolworth Building in the city of New York is 780 feet high. The Eiffel Tower, in Paris, is 984 feet high. The Washington Monument is 555 feet high."

Which of these three buildings is the tallest? Which is the lowest?

5. If you live in a city, find out who in your class live at house numbers between 100 and 1000.

Make a list of these numbers and read them. Tell which is the smallest and which is the greatest among them.

6. If you live in the country, find how many dollars it takes to buy a good horse. Is this number greater or less than 100? Is it greater or less than 1000?

See page 322.

Problem. One of two troop trains had 243 soldiers on board, and the other had 325. How many soldiers were there on the two trains?

To find how many soldiers there were on the two trains add 243 and 325.

243 325 568	*Ones:* 3, 8. Write *8*. *Tens:* 4, 6. Write *6* . *Hundreds:* 2, 5. Write *5*.	Write ones under ones, tens under tens, and hundreds under hundreds.

The sum is 5 hundreds, 6 tens, 8 ones, or 568. Hence there were 568 soldiers on the two trains.

WRITTEN EXERCISES

Copy and add:

1.	235	345	513	274	421	172
	423	512	475	622	378	416
	658	857	988	896	799	588
2.	124	345	612	543	435	112
	213	211	143	214	322	242
	321	433	233	232	242	644
	658	989	988	989	999	998

Example. Add 176 and 317.

176 317 493	*Ones:* 6, 13. Write *3*, carry 1. *Tens:* 1 (carried), 8, 9. Write *9*. *Hundreds:* 1, 4. Write *4*.	The sum is 4 hundreds, 9 tens, 3 ones, or 493.

Copy and add:

1.	249	374	528	829	437	224
	537	519	436	164	456	668
	786	893	964	993	893	892
2.	318	141	425	151	524	434
	234	328	247	315	328	217
	227	226	324	219	147	248
	779	695	996	685	999	899

See page 322.

Add: 472 *Ones:* 2, 6. Write *6.*
864 *Tens:* 7, 13. Write *3*, carry 1.
1336 *Hundreds:* 1 (carried), 5, 13. Write *13.*

The sum is 13 hundreds, 3 tens, 6 ones, or 1336. Read this number.

WRITTEN EXERCISES

Copy and add:

1.	343	256	472	513	437	352
	586	382	387	296	492	475
	929	638	859	809	929	827
2.	423	764	372	256	734	856
	294	294	456	373	195	192
	717	1058	828	629	929	1048
3.	264	352	493	342	154	567
	473	486	246	396	275	282
	737	838	739	738	429	849

Add: 475 *Ones:* 5, 10. Write *0*, carry 1.
365 *Tens:* 1 (carried), 8, 14. Write *4*, carry 1.
804 *Hundreds:* 1 (carried), 5, 8. Write *8.*

The sum is 840. Read this number.

Copy and add:

1.	246	174	169	537	287	246
	385	488	184	185	469	198
	631	662	353	722	756	444
2.	682	442	482	523	326	294
	134	192	124	194	194	378
	129	287	134	257	215	164
	945	921	740	974	735	836
3.	246	412	348	473	539	243
	432	297	296	298	187	367
	196	219	184	264	194	181
	874	928	828	1035	920	791

See page 322.

The sign for dollars is $. One dollar and twenty-five cents is written $1.25. The point (called the decimal point) between the 1 and 2 is used to separate the dollars from the cents. 39 cents is written $0.39, or $.39, or 39¢. $3.00 means 3 dollars and no cents. 3 dollars is also written $3.

In reading dollars and cents always read *and* between the dollars and the cents, as has just been done.

In a number like $3.45, the 5 represents cents, the 4 dimes and the 3 dollars.

Read the following and state how many cents, dimes, and dollars in each one: $1.85, $0.54, $0.07, $1.35, $2.50, $5.00.

Add:	
$3.18	*Ones:* 8, 16, 21. Write *1*, carry 2.
2.68	*Tens:* 2 (carried), 3, 9, 18. Write *8*, carry 1.
1.95	*Hundreds:* 1 (carried), 4, 6, 7. Write *7*.
$7.81	

The first column represents cents, and its sum is 21 cents, or 2 dimes and 1 cent. The 2 dimes are carried to the second column, which represents dimes. The sum of this column with the two carried is 18 dimes, or 1 dollar and 8 dimes. The 1 dollar is carried to the next column.

In writing a column of figures representing dollars and cents be careful to put all the decimal points in a column. Add such numbers just like other numbers. Place the decimal point in the sum directly under the other decimal points. The dollar sign is written only before the first one of the numbers to be added and before the sum.

WRITTEN EXERCISES

Copy and add the following:

1.	2.	3.	4.	5.
$3.55	$6.28	$0.39	$1.58	$2.45
0.45	5.96	4.47	2.32	1.60
2.37	0.42	1.75	3.91	2.75
$6.37	$12.66	$6.61	$7.81	$6.80

See page 323.

ORAL AND WRITTEN EXERCISES

1. Robert's mother gives him an allowance of 10¢ a week. He begins early in November to save money for Christmas. Each week he puts 6 cents into his little bank. How much does he put into the bank in 4 weeks?

2. Uncle John puts 25¢ into Robert's bank at Thanksgiving. How much does that make when added to 24 cents?

3. In December Robert puts 10 cents into his bank each week for 3 weeks. How much is this?

4. In December Robert earns 18 cents extra, which he also puts into his bank. By this time how much money does Robert have with which to buy Christmas presents.

Saved in November.......	24¢
From Uncle John.........	25¢
Saved in December.......	30¢
Earned extra in December	18¢
Total.................	

5. What gifts may Robert get for his father, mother, baby sister and Uncle John with this sum?

6. George has $.95 with which to buy presents. Make number stories about how George saved his money.

7. In what coins could George have his money?

8. If George spends $.95 for presents, Robert, $.97, and Mary $1.28, how much do they all spend for presents? **$3.20**

See page 323.

WRITTEN EXERCISES

1. James sold 24 copies of the *News* for 1 cent each, 17 copies of the *American* for 1 cent each, and 15 copies of the *Globe* for 1 cent each. How much did he get for all his papers?

This table gives the number of papers James sold each day for a week:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
News	26	30	29	34	27	28
American	29	22	33	24	31	24
Globe	12	14	11	12	13	17
Telegram	15	19	17	12	20	14

2. Find how many papers he sold each day.
3. Find how many papers he sold the whole week by adding the total daily sales.
4. If he received 1 cent for each paper, how much money did he take in each day?
5. How many cents did he get for all the papers he sold this week? Write this sum.
6. How much money would James get for all these papers if he sold them at 2 cents apiece?
7. One week a newsboy sold 500 papers at 2 cents apiece. How much did he get for them?
8. If papers were sold to the newsboys at $1.35 a hundred how much would they make by selling 100 papers at 2 cents a copy?

See page 323.

ORAL EXERCISES

1. Add 3 to each number in the table on page 74. Add by lines.
2. Count to 100 by 3's beginning with 1.
3. Count to 98 by 3's beginning with 2.
4. Count to 99 by 3's beginning with 3.
5. How does $8+3=11$ help to find $78+3=81$?
6. Add 3 to each of these numbers: 29, 38, 19, 18, 47, 28, 58, 49, 68, 79, 89, 39, 88, 59, 98.

WRITTEN EXERCISES

1. Ask your teacher how many children there are in each room on your floor of the school building. How can you find out how many children there are all together on your floor? Find this number.
2. Find how many boys there are in each room. How many boys are there all together on your floor?
3. Find how many girls there are in each room. How many girls are there all together on your floor?
4. Add the total number of girls and the total number of boys to see how many children there are all together on your floor. Is this sum the same as the one you got in Example 1? If it is not, try to find out what is wrong.

Which is easier—to find how many children there are on your floor by first counting the number in each room and then adding, or by counting up the whole number at once?

If your school has only one or two rooms, play that you are in a large school. The teacher will help you make up numbers for the rooms.

See page 324.

ORAL EXERCISES

1. Add 4 to each number in the table on page 74. Add by lines.

2. Count to 97 by 4's beginning with 1.

3. Count to 98 by 4's beginning with 2.

4. Count to 99 by 4's beginning with 3.

5. How does $9+4=13$ help to find $59+4=63$?

6. Add 4 to each of the following: 37, 48, 59, 76, 38, 49, 58, 78, 27, 39, 28, 85, 29, 87, 26, 36, 89, 47, 79, 68, 77, 69, 46, 57, 66, 86, 67, 45, 74.

WRITTEN EXERCISES

See in how many minutes you can copy and add the following:

Add downward and then test by adding upward.

1. 382	2. 198	3. 281	4. 547
124	247	132	184
197	369	164	111
218	163	217	271
921	977	794	1113

5. 276	6. 317	7. 186	8. 137
194	298	138	429
397	132	291	127
158	174	187	174
1015	921	802	867

9. 142	10. 217	11. 359	12. 234
182	171	195	256
253	284	114	178
264	151	152	191
182	162	127	123
1023	985	947	982

See page 324.

A CROSS-COUNTRY RACE

The class is to be divided into six or seven teams for a cross-country race. Captains are first selected and they choose the teams. Each captain is allowed to choose one child at a time.

The teacher reads columns of numbers to be added and the children copy them. Then all the children add the columns as fast as they can. When the first child finishes he holds up his hand, and the teacher gives him the number 1, which he writes on his paper as his score and immediately turns the paper down on his desk. The child who finishes next is given the number 2 as his score, and so on.

If two children finish at the same time they are given the same score.

The children exchange papers, and mark them as the teacher reads the sums. If an example is not done at all, or if the answer is wrong, then 5 is added to the score. If two are wrong 10 is added to the score, and so on.

The team that gets the smallest total score wins, and the one that gets the largest score is last in the race.

In one school where they used this game they named the teams after some large schools in the city. Try to find good names for your teams.

WRITTEN EXERCISES

In such a race the teacher reads the five columns of numbers given below.

See how long it takes you to copy them all neatly and add them.

1.	2.	3.	4.	5.
436	643	790	124	147
569	908	467	680	358
234	460	248	357	491
436	376	926	913	578
1675	2387	2431	2074	1574

See page 324.

Problem. A farmer had 79 head of cattle and sold 34 of them. How many had he left? How do you find out?

To find how many cattle he had left subtract 34 from 79.

$\boxed{\begin{array}{r}79\\34\\\hline 45\end{array}}$

Ones: 9=4+*5*. Write *5*.
Tens: 7=3+*4*. Write *4*.
} First Method

Ones: 4 from 9 leaves *5*. Write *5*.
Tens: 3 from 7 leaves *4*. Write *4*.
} Second Method

Example. From 489 subtract 201.

$\boxed{\begin{array}{r}489\\201\\\hline 288\end{array}}$

Ones: 9=1+*8*. Write *8*.
Tens: 8=0+*8*. Write *8*.
Hundreds: 4=2+*2*. Write *2*.
} First Method

Ones: 1 from 9 leaves *8*. Write *8*.
Tens: 0 from 8 leaves *8*. Write *8*.
Hundreds: 2 from 4 leaves *2*. Write *2*.
} Second Method

> The result found in subtraction is called **difference** or **remainder.**

We can find the difference between two numbers by taking the smaller away from the larger or by finding how much must be added to the smaller to make the sum equal to the larger. You should choose one of these methods now, and use that one only.

WRITTEN EXERCISES

Copy and subtract:

1.	89	37	78	57	84	79	85	97
	43	14	34	26	21	36	63	45
	46	23	44	31	63	43	22	52
2.	93	59	95	99	98	86	78	84
	41	42	34	47	67	43	23	41
	52	17	61	52	31	43	55	43
3.	874	856	478	579	639	794	587	934
	561	432	134	348	416	342	134	423
	313	424	344	231	223	452	453	511

See page 325.

John is 9 years old. Harry is 14 years old. Their father is 45 years old.

ORAL AND WRITTEN EXERCISES

1. How old was John's father 9 years ago when John was born?

2. How old was Harry's father 14 years ago?

We must subtract 14 from 45.

$$\boxed{\begin{array}{r}45\\ \underline{14}\\ 31\end{array}}$$

3. In how many years will Harry be 45 years old? How do you find out?

4. How many years ago was Harry's father 14 years old? How do you find out?

John weighs 62 pounds. Harry weighs 83 pounds. Their father weighs 187 pounds.

5. Harry weighs how much more than John?

Remember that in subtraction problems the smaller number is placed below the larger. That is, we subtract the smaller number from the larger.

6. John weighs how much less than his father?

7. Harry weighs how much less than his father?

8. Does the father weigh more or less than John and Harry together? How much?

9. How much will John have to gain to weigh as much as his father does now?

See page 325.

ORAL EXERCISES

1. Add 5 to each number in the table on page 74. Add by lines.
2. Begin with 1 and count to 96 by 5's.
3. Add 5 to each of the following numbers: 26, 38, 47, 45, 79, 65, 27, 39, 46, 55, 67, 78, 25, 37, 87, 57, 66, 77, 28, 36, 75, 56, 68, 89.
4. Begin with 2 and count to 98 by 6's.
5. Add 6 to each number in the last 5 lines of the table on page 74.
6. Add 7 to each of the last six lines of this table.
7. Add 6 to each of the numbers 27, 36, 49, 57, 48, 25, 56, 77, 36, 75, 68, 89.

Problem. Henry wants to buy a pair of skates which cost $2.75. If he has $1.42 cents in his bank, how much more must he get to buy the skates? How do you find out?

To find how much more money he must have, subtract $1.42 from $2.75.

$2.75
1.42
$1.33

Subtract just as if there were no decimal points. Then put a decimal point in the answer just below the decimal points in the other numbers.

The remainder is $1.33, and this is the amount Henry must get to buy the skates.

WRITTEN EXERCISES

Copy and subtract:

1. $4.85	2. $7.60	3. $8.75	4. $9.76
2.40	3.40	4.25	4.24
$2.45	$4.20	$4.50	$5.52
5. $7.45	6. $12.46	7. $6.35	8. $9.78
2.32	1.24	2.15	2.47
$5.13	$11.22	$4.20	$7.31

See page 325.

Some third-grade children made candy for Christmas. They figured the cost of it to see whether it was cheaper to make the candy than to buy it at the store. They used:

3 cups of sugar at 4¢ a cup,
Syrup worth 5 cents,
¼ of a dozen eggs at 40¢ a dozen,
1 pound of English walnuts at 20¢.

ORAL AND WRITTEN EXERCISES

1. How much did the sugar cost them?
2. How much did the eggs cost them?
3. How much did all the materials cost?

12¢
5¢
10¢
20¢

4. They made 2 pounds of candy which would cost 60¢ a pound at the store. How much would they have to pay for 2 pounds of candy at the store?
5. How much would the candy cost if they used 10 cents' worth of shelled pecans instead of the 20 cents' worth of English walnuts?
6. What is the cost of 3 pounds of stick candy at 25 cents a pound?
7. What is the cost of 4 pounds of brittle candy at 20 cents a pound?
8. If chocolate candy costs 80 cents a pound, how much will ½ a pound cost?
9. Mary spent 20 cents for candy, and her sister Elsie spent 30 cents. How much did they spend together?
10. In a large Sunday School they had $5.60 with which to buy Christmas candy. How much did they have left after spending $4.20. **$1.40**

See page 325.

ORAL EXERCISES

1. Vera has fifty cents with which to buy Christmas presents. What can she buy from the following list?

Handkerchiefs	10¢, 15¢, 25¢, 40¢
Neckties	25¢, 50¢
Shaving cups	10¢, 15¢, 20¢, 50¢
Salts and peppers	25¢, 50¢
Nail files	10¢, 15¢, 20¢
Boxes of candy	25¢, 40¢, 50¢
Dolls	15¢, 25¢, 50¢
Drums	25¢, 40¢, 50¢
Toy automobiles	20¢, 30¢, 50¢

2. If you had one dollar to spend, what would you buy from this list?

3. Tell what presents you would buy from this list if you had $1.50 to spend. Also tell what you would buy if you had seventy-five cents to spend.

4. Nellie bought a handkerchief for 25¢ for her mother, a tie for 25¢ for her brother, a tie for 50¢ for her father, and a doll for 15¢ for her little sister. How much did all these cost her?

5. John bought a toy automobile for 30¢, a nail file for 20¢, and a drum for 40¢. How much did all these cost him? How much change did he get from one dollar?

6. Find the cost of some presents you would like to buy. Then tell a story about what you will get for the money you have to spend for Christmas presents.

See page 326.

WRITTEN EXERCISES

1. Walter saved $2.20 for Christmas, and his sister Jane saved $3.75. How much less did Walter save than Jane? How do you find out?

We must subtract $2.20 from $3.75. Place the smaller number below the larger. Be sure that the decimal points are in column.

$$\boxed{\begin{array}{r}\$3.75\\ 2.20\\ \hline \$1.55\end{array}}$$

2. Name some presents that Jane and Walter could buy with their money. How much would these presents cost?

3. Albert wants to buy a sled which costs $2.45. He has $1.23 in his bank. How much more must he get before he can buy the sled? How do you find out? $1.22

4. Henry went into a store with $3.85 in his pocket, and came out with $1.42. How much did he spend in the store? How do you find out? $2.43

5. Mr. Harper spent $1.50 for a present for his son Harry, $1.75 for his son John, $2.25 for his daughter Alice, and $1.00 for a servant. How much did all these presents cost him? How do you find out? $6.50

6. Mary bought the following presents: Two handkerchiefs for her mother for 49 cents, a tie for her father for 50 cents, a knife for her brother for 65 cents, and a doll for her little sister for 40 cents. How much did all these presents cost her? $2.04

7. A Sunday School has a Christmas tree on which there is a present for every child in the school. There are 8 children in the first class, 14 in the second, 12 in each of the third and fourth classes, and 17 in the fifth class. How many presents are there on the tree? 63

See page 326.

ORAL EXERCISES

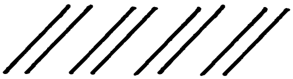
1. **Review the table of 2's on pages 18 and 35.**

Give the products of the following:

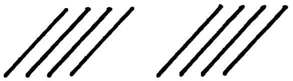
2.	2	4	2	6	9	2	3	2	1	2
	4	2	6	2	2	9	2	3	2	1
3.	8	2	5	2	2	2	7	2	10	9
	2	8	2	5	2	7	2	10	2	2

Six of anything may be divided in two groups of 3 in each. Then each group is ½ of 6. This may be expressed by $6 \div 2 = 3$, which is read "6 divided by 2 equals 3".

> The result found by dividing is called the **quotient.**
> The sign of division ÷ is read "divided by."



8 can be divided into 4 equal groups with 2 in each group. That is, $8 \div 4 = 2$, or ¼ of $8 = 2$.



8 can be divided into 2 equal groups with 4 in each group. That is, $8 \div 2 = 4$, or ½ of $8 = 4$.

All these facts we may learn at once from $2 \times 4 = 8$.

Read and supply the missing numbers in the following:

4. $2 \times 6 = ?$
$12 \div 2 = ?$
$12 \div 6 = ?$
½ of $12 = ?$
⅙ of $12 = ?$

5. $2 \times 8 = ?$
$16 \div 2 = ?$
$16 \div 8 = ?$
½ of $16 = ?$
⅛ of $16 = ?$

6. $2 \times 10 = ?$
$20 \div 2 = ?$
$20 \div 10 = ?$
½ of $20 = ?$
⅒ of $20 = ?$

7. Give similar combinations for 2×5, 2×7, 2×9.

See page 326.

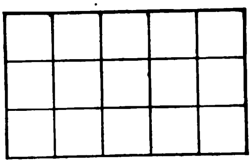
ORAL AND WRITTEN EXERCISES

1. Review the table of 3's on pages 20 and 61.

2. Supply the missing numbers in the following:

6+3=?	9+3=?	12+3=?	15+3=?
3×3=?	4×3=?	5×3=?	6×3=?
18+3=?	21+3=?	24+3=?	27+3=?
7×3=?	8×3=?	9×3=?	10×3=?

From the rectangle we see that 3 rows with 5 in each contain the same number as 5 rows with 3 in each. That is, 3×5=5×3.



3. Draw a rectangle to show that 3×6 =6×3.

In this way we may show that 3×7=7×3, 3×8=8×3, 3×9=9×3, and 3×10=10×3.

The product of two numbers is the same when their order is reversed.

From now on we will record among the new number facts only one of two such combinations as 3×8=24 and 8×3=24. When we know one of these we always know the other.

New Number Facts
9×3=27
10×3=30

4. Write the table of 3's beginning with 3×1, 3×2, 3×3, and so on.

5. If you know that 6×3=18, how do you know from that that 3×6=18?

6. Play a game like that on page 19, using the tables of 2's and 3's.

See page 326.

ORAL EXERCISES

Read and supply the missing numbers:

1. 1 yard = feet
5 yards = feet
4 yards = feet
2 yards = feet
8 yards = feet
3 yards = feet
6 yards = feet
9 yards = feet
7 yards = feet
10 yards = feet

2. $2\times3=?$
$3\times2=?$
$6\div2=?$
$6\div3=?$
$\frac{1}{2}$ of $6=?$
$\frac{1}{3}$ of $6=?$

3. $4\times3=?$
$3\times4=?$
$12\div3=?$
$12\div4=?$
$\frac{1}{3}$ of $12=?$
$\frac{1}{4}$ of $12=?$

4. $5\times3=?$
$3\times5=?$
$15\div3=?$
$15\div5=?$
$\frac{1}{3}$ of $15=?$
$\frac{1}{5}$ of $15=?$

5. $6\times3=?$
$3\times6=?$
$18\div3=?$
$18\div6=?$
$\frac{1}{3}$ of $18=?$
$\frac{1}{6}$ of $18=?$

6. $7\times3=?$
$3\times7=?$
$21\div3=?$
$21\div7=?$
$\frac{1}{3}$ of $21=?$
$\frac{1}{7}$ of $21=?$

7. $8\times3=?$
$3\times8=?$
$24\div3=?$
$24\div8=?$
$\frac{1}{3}$ of $24=?$
$\frac{1}{8}$ of $24=?$

8. Give combinations like those given above for 9×3 and for 10×3.

9. What other combinations are known from $3\times3=9$?

10. At 3 cents apiece what is the cost of 6 pencils? of 7 pencils? of 9 pencils?

11. In a certain city children pay 3 cents for carfare. How much do 8 rides cost in that city? 5 rides? 4 rides? 3 rides?

12. How many yards are there in 18 feet? in 24 feet? in 12 feet? in 30 feet? in 15 feet? in 27 feet? in 21 feet?

See page 327.

ORAL EXERCISES

24+4=? 28+4=? 32+4=? 36+4=?

7×4=? 8×4=? 9×4=? 10×4=?

New Number Facts

7×4=28 8×4=32 9×4=36 10×4=40

Give the products of the following:

1.	4	2	6	4	7	4	3	4	1	4
	2	4	4	6	4	7	4	3	4	1

2.	5	4	8	4	10	4	4	9	4
	4	5	4	8	4	10	4	4	9

If any of these cause you trouble make a list of them and make sure you learn them well.

Read and supply the missing numbers in:

3. 2×4=?
4×2=?
8÷2=?
8÷4=?
½ of 8=?
¼ of 8=?

4. 3×4=?
4×3=?
12÷3=?
12÷4=?
⅓ of 12=?
¼ of 12=?

5. 5×4=?
4×5=?
20÷4=?
20÷5=?
¼ of 20=?
⅕ of 20=?

6. 6×4=?
4×6=?
24÷4=?
24÷6=?
¼ of 24=?
⅙ of 24=?

7. 7×4=?
4×7=?
28÷4=?
28÷7=?
¼ of 28=?
⅐ of 28=?

8. 8×4=?
4×8=?
32÷4=?
32÷8=?
¼ of 32=?
⅛ of 32=?

9. Give similar combinations for 9×4 and for 10×40.

10. What other combinations do we know from 4×4=16?

See page 327.

In keeping tally, marks are put in groups of five like this 𝍸 Then the groups are counted.

ORAL EXERCISES

1. Review the table of 5's on pages 40 and 41. By counting the number of groups, tell how many marks there are in each of the following:

2. 𝍸 𝍸 𝍸 𝍸

3. 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸

4. 𝍸 𝍸 𝍸 𝍸 𝍸

5. 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸

6. Give all the combinations which you know from 4×5=20.

7. Give all the combinations which you know from each of the combinations 6×5, 7×5, 8×5, 9×5.

Cards for a Number Game. Cut out cards 5 inches long and 3 inches wide and write numbers on them to make a set like those shown on the next page. These cards represent the table of 3's.

See page 305.

Make cards like these for all the tables you have learned.

Question cards	1 3	2 3	3 3	4 3	5 3	6 3	7 3	8 3	9 3	10 3
Answer cards	3	6	9	12	15	18	21	24	27	30

A NUMBER GAME

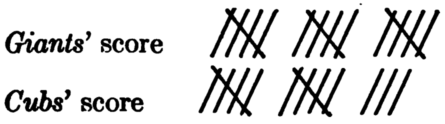
For the following game, two answer cards are needed for each question card.

Two captains are appointed and they choose teams. Each child gets an answer card; and the teacher keeps all the question cards. The answer cards are given out in such a way that each team has an answer for each question card.

The teacher holds up a question card. The child who first holds up the right answer card gets a score for his team. When two children, one from each team, hold up the right card at the same time, each team gets a score.

When a child holds up a wrong answer card, his team loses one score. The teacher or one of the children keeps score.

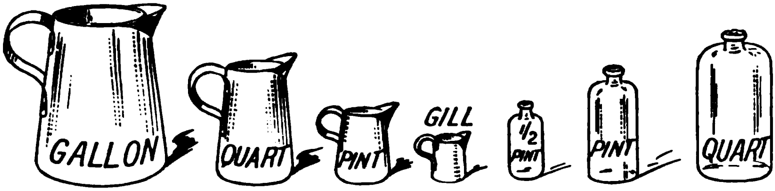
In one school where this game was played, one team was called the *Giants*, and the other the *Cubs*.



After playing for a while the children exchange cards.

Sometimes the teacher takes the answer cards and holds them up. The children must then hold up the right question cards.

See page 327.



ORAL EXERCISES

1. How much does an ordinary milk bottle hold?
2. Sometimes milk is bought by the pint. How many pints are there in one quart?
3. Cream is often bought in half-pint bottles. How many half-pints equal one quart?
4. If cream is 9 cents a half-pint, how much is a pint worth? A quart?
5. Find out how much milk and cream cost in your town. How much does a quart of milk cost? A quart of cream?
6. Find out how many quarts there are in one gallon.

7. In hotels and boarding houses milk is often bought by the gallon. How many quarts are there in 8 gallons?
8. At 24 cents a gallon for milk, what is the price per quart? At 32 cents a gallon, what is the price per quart?
9. Name all the articles you can think of that are sold by the gallon.

The gill is a small measure that is not much used. There are 4 gills in 1 pint.

An ordinary glass holds about a half-pint.

See page 323.

THE TABLE OF LIQUID MEASURE

4 **gills** = 1 **pint** (4 gi. = 1 pt.)
2 pints = 1 **quart** (2 pt. = 1 qt.)
4 quarts = 1 **gallon** (4 qt. = 1 gal.)

ORAL EXERCISES

1. Read the following and supply the missing numbers:

4 gal. = qt. 3 gal. = qt.
2 gal. = qt. 9 gal. = qt.
6 gal. = qt. 7 gal. = qt.
5 gal. = qt. 8 gal. = qt.

2. A pint is what part of a quart?

3. A quart is what part of a gallon?

Division is often indicated by writing $4\overline{)20} = 5$ or $\overset{5}{4\overline{)20}}$ instead of $20 \div 4 = 5$.

Give the quotients in the following:

4. $4\overline{)16}$ $5\overline{)35}$ $3\overline{)12}$ $2\overline{)12}$ $8\overline{)24}$ $8\overline{)32}$
5. $4\overline{)12}$ $5\overline{)25}$ $3\overline{)24}$ $2\overline{)14}$ $8\overline{)16}$ $9\overline{)27}$
6. $4\overline{)20}$ $5\overline{)45}$ $3\overline{)18}$ $2\overline{)10}$ $8\overline{)40}$ $6\overline{)12}$
7. $4\overline{)32}$ $5\overline{)50}$ $3\overline{)30}$ $2\overline{)8}$ $7\overline{)14}$ $6\overline{)18}$
8. $4\overline{)8}$ $5\overline{)40}$ $3\overline{)15}$ $2\overline{)18}$ $7\overline{)21}$ $6\overline{)24}$
9. $4\overline{)24}$ $5\overline{)30}$ $3\overline{)9}$ $2\overline{)16}$ $7\overline{)35}$ $6\overline{)30}$
10. $4\overline{)36}$ $5\overline{)20}$ $3\overline{)21}$ $2\overline{)4}$ $9\overline{)18}$ $8\overline{)80}$
11. $4\overline{)40}$ $5\overline{)15}$ $3\overline{)27}$ $2\overline{)20}$ $9\overline{)45}$ $9\overline{)90}$

Play a game like the one on page 71, supplying missing numbers in combinations such as $\frac{1}{5}$ of 25, $6\overline{)30}$.

See page 328.

ORAL EXERCISES

1. How many days do you go to school each week?

2. How many days do you go to school in 2 weeks? in 3 weeks? in 4 weeks? in 5 weeks? in 6 weeks? in 7 weeks? in 8 weeks? in 9 weeks? in 10 weeks?

3. How many days do you attend school in 4 weeks if you miss school 2 days?

4. How many days do you attend school in 8 weeks if you miss school 3 days?

5. How many days do you miss school if you attend 48 days in 10 weeks?

6. What children in your room have had perfect attendance for a month? What child has the longest record for perfect attendance? How many days of perfect attendance does this record show?

7. How many 5's are there in 10? in 20? in 30? in 35? in 15? in 40? in 25? in 45?

8. How many nickels are there in 35 cents? in 20 cents? in 45 cents? in 30 cents? in 50 cents? in 40 cents? in 25 cents?

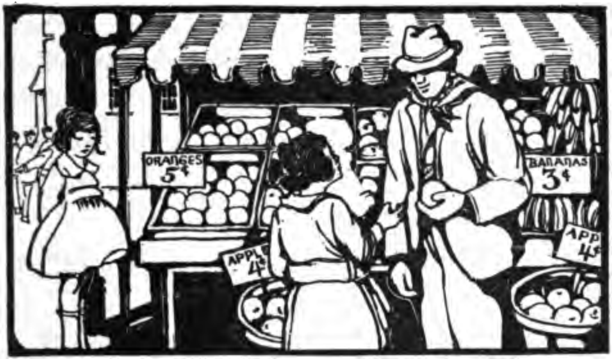
9. How many nickels and cents are there in 12 cents? in 18 cents? in 21 cents? in 29 cents? in 43 cents?

10. Which is more money, 9 nickels or 4 dimes? how much?

11. Which is more money, 5 nickels or 3 dimes? how much?

12. In a western town daily papers sell for 5 cents when bought one at a time. If subscribed for, the papers are delivered at the houses at 20 cents a week. How much is saved in one week of 7 days by subscribing for the paper? How much is saved in 4 weeks?

See page 328.



Tony has a fruit stand near the school where the children buy fruit for their lunch.

ORAL EXERCISES

1. How much do the oranges cost apiece? the apples? the bananas?

2. On Monday Tony sold 8 oranges, 6 apples, and 6 bananas. How much did he get for the oranges? for the apples? for the bananas?

Read the following and supply the missing numbers:

3. Tuesday's sale:
10 apples for cents
9 oranges for cents
8 bananas for cents

4. Wednesday's sale:
7 apples for cents
7 oranges for cents
7 bananas for cents

5. Thursday's sale:
10 oranges for cents
9 bananas for cents
8 apples for cents

6. Friday's sale:
6 oranges for cents
9 apples for cents
10 bananas for cents

WRITTEN EXERCISES

Find the total received for each day's sale and for the four days' sale.

See page 329.

ORAL EXERCISES

1. Add 6 to each number in the table on page 74. Add by lines.
2. Add 6 to each of the following numbers: 73, 28, 46, 75, 57, 69, 26, 38, 45, 65, 78, 89.
3. Beginning with 1 count by 6's to 97.
4. Add 7 to each number in the table on page 74. Add by lines.
5. Add 7 to each of the following numbers: 88, 76, 67, 56, 45, 38, 78, 44, 37, 48, 54.
6. Beginning with 1 count to 99 by 7's.
7. Beginning with 3 count to 94 by 7's.

WRITTEN EXERCISES

Add:

1.	47	187	34	76	247	93
	94	84	282	49	196	65
	82	48	56	83	84	87
	76	259	89	564	76	59
	299	578	461	772	603	304
2.	67	36	49	286	174	79
	78	72	57	241	291	82
	89	64	64	136	87	46
	84	89	87	159	156	97
	65	43	38	82	248	85
	383	304	295	904	956	389
3.	94	13	681	47	268	134
	76	40	136	65	194	278
	58	74	99	94	182	291
	30	108	88	85	356	119
	12	496	77	76	97	69
	270	731	1081	367	1097	891

See page 329.

Adding 9. In 27+9=36 we notice that by adding 9 the number in tens' place is made one larger and the number in ones' place is made one smaller. Study these sums:

$$\begin{array}{ccccccc} 47 & 43 & 78 & 35 & 29 & 64 & 76 \\ 9 & 9 & 9 & 9 & 9 & 9 & 9 \\ \hline 56 & 52 & 87 & 44 & 38 & 73 & 85 \end{array}$$

In each the number in ones' place is made 1 smaller and the number in tens' place 1 larger. 9 may be added in this way to any number unless its figure in ones' place is 0.

Adding 8. In 46+8=54 we notice that by adding 8 the figure in ones' place is made 2 smaller and the figure in tens' place is made one larger. Study these sums:

$$\begin{array}{ccccccc} 76 & 53 & 69 & 45 & 17 & 34 & 68 \\ 8 & 8 & 8 & 8 & 8 & 8 & 8 \\ \hline 84 & 61 & 77 & 53 & 25 & 42 & 76 \end{array}$$

In each the number in ones' place is made 2 smaller and the number in tens' place 1 larger. 8 may be added this way to any number unless its figure in ones' place is 0 or 1.

ORAL EXERCISES

1. In the way just explained add 9 to each number in the 3d, 4th, 5th, 6th, and 7th lines of the table on page 74.
2. Add 9 to each of the numbers 43, 37, 85, 76, 65, 73, 34, 57, 48, 29.
3. Tell how 9 may be added to a number.
4. In the way just explained add 8 to each number in the 3d, 4th, 5th, 6th, and 7th lines of the table on page 74.
5. Add 8 to each of the numbers 67, 34, 89, 23, 46, 55, 74, 82, 49, 65.
6. Tell how 8 may be added to a number.

See page 329.

ORAL EXERCISES

1. In 2874 what figure is in ones' place? What figure is in tens' place? What figure is in hundreds' place? What figure is in thousands' place?

The number 2874 is read, two thousand eight hundred seventy-four.

The number 45,374 is read, forty-five thousand three hundred seventy-four.

The number 287,940 is read, two hundred eighty-seven thousand nine hundred forty.

The comma is used to separate hundreds from thousands when the number contains more than four figures.

2. Read each of the following numbers:

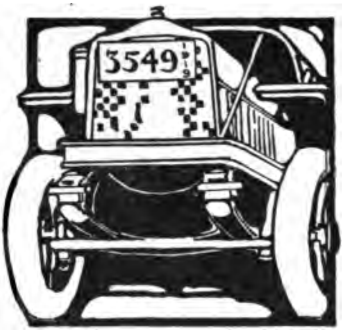
7835
5345
9176
8106
9476
15,861
43,554
27,136
81,930
12,570
8376
55,445
68,327
30,485
410,904
93,847
9482
1495
5274
6500
41,183
77,391
23,632
367,804
219,086

WRITTEN EXERCISES

Write each of the following numbers:

Four thousand three hundred fifty-one;
Three thousand six hundred thirty-nine;
One thousand two hundred twenty-three;
Two thousand one hundred seventeen;
Seven thousand nine hundred eighty-five;
Eight thousand three hundred forty-six;
Four thousand eight hundred ninety-one;
Six thousand four hundred fifty-two;
Nine thousand seven hundred sixty-four;
Five thousand five hundred seventy-eight;
Twenty-four thousand two hundred twelve.

See page 329.



WRITTEN EXERCISES

1. Read the number on this truck.

2. Notice with care the numbers on several automobiles. Write these numbers and read them.

3. Read the number on the house shown in the picture.

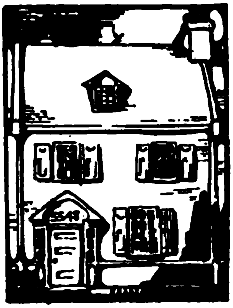
4. If you live in a city, what is the number of your house?

5. Which member of the class has the largest house number? Which has the smallest?

6. What is your telephone number? Find the telephone numbers of some of your friends.

7. What year is this? In what year were you born?

8. Read the following: There are 365 days in a year. There are 5280 feet in one mile. Lincoln was born in 1809 and died in 1865.



In the number 2300 there are 2 thousands, 3 hundreds, no tens and no ones. It is read, two thousand three hundred.

9. In 4000 there are how many thousands, hundreds, tens and ones?

10. How many thousands, hundreds, tens, and ones are there in each of the following: 7000, 8000, 9000 6000, 5000, 4000, 3400, 2507, 3740, 4209, 3704, 4290? `Read each of these numbers.

11. How many thousands, hundreds, tens, and ones are there in each of the following: 5071, 5309, 4063, 3004?

See page 330.

Play keeping a school lunch counter. Cut out little pieces of paper for toy money; or, if you have toy money, use that. Pay the cashier with this toy money. If the cashier gives you the wrong change, he is discharged and you become the new cashier if you notice the mistake before you leave the counter. Do not stay too long at the counter.

LIST OF PRICES

Soup	5¢	Milk	3¢
Ham Sandwich	5¢	Baked Potato	5¢
Chicken Sandwich	8¢	Lamb Chop	12¢
Egg	5¢	Ice Cream	5¢
Bread and Butter	2¢	Cake	5¢

ORAL EXERCISES

John orders soup, a chicken sandwich, and a glass of milk. How much is his bill? He gives the cashier 25 cents. The cashier says his bill is 16 cents. Is this right? When the cashier makes change he says: "Your bill is 16," then he puts down 4 cents and says "20," then 5 cents more and says "25." How much change does John get?

Tell what you would order from this bill and how much it would cost.

See page 330.

In a subtraction problem the larger number is called the **minuend,** the smaller is called the **subtrahend.** We subtract the subtrahend from the minuend.

Problem. John's father is 36 years old and his grandfather is 83 years old. How old was John's grandfather when his father was born? How do you find out?

We must subtract 36 from 83.

FIRST METHOD

Since 3 cannot be the sum of 6 and any other number, we add 10 to 3, making 13. Since 10 is added to the minuend, we must also add 10 to the subtrahend. We say "*carry* 1" to the subtrahend.

83 (minuend) *Ones:* $13 = 6 + 7$. Write *7*. Carry 1.

36 (subtrahend) *Tens:* $8 = 1$ (carried) $+ 3 + 4$. Write *4*.

47 (difference or remainder).

In practice the 1 carried and 3 in the *subtrahend* are at once seen to be 4 without naming the two numbers 1 and 3.

SECOND METHOD

Since 6 ones cannot be taken from 3 ones, take 1 ten from the 8 tens, leaving 7 tens. 1 ten + 3 ones = 13 ones. We say:

83 *Ones:* 6 from $13 = 7$ Write *7*.

36 *Tens:* 3 from $7 = 4$ Write *4*.

47 The difference is 47.

WRITTEN EXERCISES

Subtract:

1.	53	74	92	83	52	74	85	37
	27	57	68	49	29	47	58	13
	26	17	24	34	23	27	27	24

See page 330

Example 1. Subtract 43 from 90.

$$\boxed{\begin{array}{r}90\\43\\\hline 47\end{array}}\quad \left.\begin{array}{l}\textit{Ones:}\ 10=3+7.\ \text{Write } 7.\ \text{Carry 1.}\\ \textit{Tens:}\ 9=5+4.\ \text{Write } 4.\end{array}\right\}\text{First Method}$$

$$\boxed{\begin{array}{r}90\\43\\\hline 47\end{array}}\quad \left.\begin{array}{l}\textit{Ones:}\ 3 \text{ from } 10=7.\ \text{Write } 7.\\ \textit{Tens:}\ 4 \text{ from } 8=4.\ \text{Write } 4.\end{array}\right\}\text{Second Method}$$

WRITTEN EXERCISES

Subtract:

1.	80	70	90	60	30	40	90	70
	63	35	52	41	14	24	37	48
	17	35	38	19	16	16	53	22
2.	40	70	60	90	80	50	80	60
	17	51	24	37	58	27	36	29
	23	19	36	53	22	23	44	31

Example 2. Subtract 246 from 631.

$$\boxed{\begin{array}{r}631\\246\\\hline 385\end{array}}\quad \left.\begin{array}{l}\textit{Ones:}\ 11=6+5.\ \text{Write } 5.\ \text{Carry 1.}\\ \textit{Tens:}\ 13=5+8.\ \text{Write } 8.\ \text{Carry 1.}\\ \textit{Hundreds:}\ 6=3+3.\ \text{Write } 3.\\ \quad\text{The difference or remainder is 385.}\end{array}\right\}\text{First method}$$

$$\boxed{\begin{array}{r}631\\246\\\hline 385\end{array}}\quad \left.\begin{array}{l}\textit{Ones:}\ 6 \text{ from } 11=5.\ \text{Write } 5.\\ \textit{Tens:}\ 4 \text{ from } 12=8.\ \text{Write } 8.\\ \textit{Hundreds:}\ 2 \text{ from } 5=3.\ \text{Write } 3.\end{array}\right\}\text{Second method}$$

WRITTEN EXERCISES

Subtract:

1.	424	535	831	978	743	645
	167	267	496	389	267	387
	257	268	335	589	476	258
2.	854	778	637	546	346	556
	367	289	479	358	187	378
	487	489	158	188	159	178

See page 331.

Problem. In one school there are 1283 children and in another there are 1227 children. How many more children are there in the larger school than in the smaller one? How do you find out?

We must subtract 1227 from 1283.

1283 1227 56	*Ones:* 13 = 7 + *6*. Write *6*. Carry 1. *Tens:* 8 = 3 + *5*. Write *5*.	First Method
1283 1227 56	*Ones:* 7 from 13 = 6. Write *6*. *Tens:* 2 from 7 = 5. Write *5*.	Second Method

We notice at once that the figures in the third and fourth places will be zeros. Since 56 and 0056 represent the same numbers the zeros are not written down. When zeros are to be left out for this reason we must make sure that there is no figure other than zero to the left of them.

In this case the two zeros must be written since the figure 3 is to the left of them.

4372
1367
3005

Subtract:

1. 5637 2752 2885	2. 1789 1737 52	3. 2483 2438 45	4. 6487 5378 1109
5. 3447 1989 1458	6. 8147 2139 6008	7. 4762 4658 104	8. 2140 2062 78
9. 8297 7289 1008	10. 4457 4358 99	11. 2934 1896 1038	12. 2147 2096 51
13. 1397 1329 68	14. 3765 3687 78	15. 3736 2892 844	16. 5186 4946 240

See page 332.

Problem. In one town there were 9241 people and in another 6092 people. How many more people were there in the larger town than in the smaller? How do you find out?

To find how many more people there are in the larger town subtract 6092 from 9241.

$$\boxed{\begin{array}{r}9241\\6092\\\hline 3149\end{array}}$$

Ones:	11 = 2 + *9*. Write *9*.	Carry 1.	First Method
Tens:	14 = 10 + *4*. Write *4*.	Carry 1.	
Hundreds:	2 = 1 + *1*. Write *1*.		
Thousands:	9 = 6 + *3*. Write *3*.		

$$\boxed{\begin{array}{r}9241\\6092\\\hline 3149\end{array}}$$

Ones:	2 from 11 = 9. Write *9*.	Second Method
Tens:	9 from 13 = 4. Write *4*.	
Hundreds:	0 from 1 = 1. Write *1*.	
Thousands:	6 from 9 = 3. Write *3*.	

To test the result add the remainder to the subtrahend. The result should be the minuend. To perform this addition do not copy the numbers again. Cover up the minuend with a sheet of paper and then add. Then compare your sum with the minuend.

WRITTEN EXERCISES

Subtract and test each remainder:

1. 914 278 636	2. 5236 1978 3258	3. 2472 1484 988	4. 8112 2789 5323
5. 4728 1802 2926	6. 3915 1200 2715	7. 3988 2009 1979	8. 5461 3007 2454
9. 3576 2092 1484	10. 8774 3902 4872	11. 4516 2704 1812	12. 1645 1504 141
13. 1529 809 720	14. 2944 1708 1236	15. 6214 4008 2206	16. 31928 20006 11922

See page 332.

Example. From 16002 subtract 9343.

16002 9343 6659				
	Ones:	12 = 3 + *9*.	Write *9*.	Carry 1.
	Tens:	10 = 5 + *5*.	Write *5*.	Carry 1.
	Hundreds:	10 = 4 + *6*.	Write *6*.	Carry 1.
	Thousands:	16 = 10 + *6*.	Write *6*.	

First Method

In this case take 1 thousand from the 6 thousand. But 1 thousand is 9 hundreds, 9 tens and 10 ones. Then

16002 9343 6659			
	Ones:	3 from 12 = 9.	Write *9*.
	Tens:	4 from 9 = 5.	Write *5*.
	Hundreds:	3 from 9 = 6.	Write *6*.
	Thousands:	9 from 15 = 6.	Write *6*.

Second Method

Subtract and test each remainder:

1. 438	2. 790	3. 5200	4. 748
298	436	3420	296
140	**354**	**1780**	**452**
5. 4400	6. 2702	7. 4208	8. 5740
1284	1687	1824	2826
3116	**1015**	**2384**	**2914**
9. 3509	10. 4785	11. 15382	12. 29864
2304	1584	12674	12898
1205	**3201**	**2708**	**16966**
13. 13072	14. 8200	15. 4000	16. 13002
6009	2496	2192	6048
7063	**5704**	**1808**	**6954**
17. 3900	18. 18000	19. 8009	20. 21008
2704	9475	2786	18099
1196	**8525.**	**5223**	**2909**
21. 4108	22. 1740	23. 8760	24. 32040
2624	898	2407	27409
1484	**842**	**6353**	**4631**

See page 332.

WRITTEN EXERCISES

1. Columbus was born in the year 1446. He discovered America in 1492. How old was he at that time? How do you find out? **46 yrs.**

2. Washington was born in 1732. He was elected the first President of the United States in 1788. How old was he then? Washington died in the year 1799. How old was he at the time of his death? **56 yrs. 67 yrs.**

3. Lincoln was born 1809 and died 1865. How old was he at the time of his death? **56 yrs.**

4. How old is your father now? Can you find out from this in what year he was born? How many years ago was that?

5. In what year were you born? How old will you be in 1937? in 1949?

This farmer is hauling hay to town. On this big scale they first weigh the wagon with the hay on, and then weigh it after the hay has been taken off. For several reasons the wagon does not always weigh the same.

See page 333.

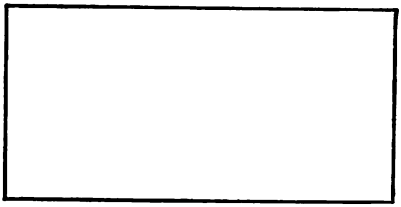
From the weights given below find how much hay the farmer hauled on each load.

The man who does the weighing figures out how much hay there is on each load. In weighing heavy things of this sort amounts less than 10 pounds are disregarded. Hence, the last figure in the weights is always zero.

	First Load		Second Load
1.	pounds Load and wagon 3640 Wagon..........1480 **2160**	Monday	pounds Load and wagon 3720 Wagon..........1470 **2250**
2.	pounds Load and wagon 3480 Wagon..........1490 **1990**	Tuesday	pounds Load and wagon 3520 Wagon..........1470 **2050**
3.	pounds Load and wagon 3620 Wagon..........1480 **2140**	Wednesday	pounds Load and wagon 3760 Wagon..........1490 **2270**
4.	pounds Load and wagon 3740 Wagon..........1500 **2240**	Thursday	pounds Load and wagon 3580 Wagon..........1490 **2090**
5.	pounds Load and wagon 3740 Wagon..........1480 **2260**	Friday	pounds Load and wagon 3780 Wagon..........1470 **2310**
6.	pounds Load and wagon 3240 Wagon..........1510 **1730**	Saturday	pounds Load and wagon 2730 Wagon..........1520 **1210**

See page 333.

ORAL AND WRITTEN EXERCISES



1. This figure represents a flower bed. If one inch represents 2 feet, how long is the flower bed? How wide is it?

2. A boy's garden patch is 6 feet long and 4 feet wide. Make a drawing of it, letting one inch represent one foot. How many inches long must the drawing be? How wide must it be?

3. A room is 16 feet long by 12 feet wide. Make a drawing of it, letting one inch represent 4 feet. How long and how wide must the drawing be?

4. How many yards wide is your schoolroom? How many yards long is it? Measure to the nearest yard.

5. Draw a figure to represent the schoolroom, letting 1 inch represent 1 yard. How long and how wide is the drawing?

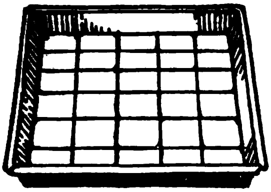
6. Make a drawing to represent a schoolroom 6 yards wide and 8 yards long. If one inch represents a yard, how large must the drawing be?

7. A school assembly hall is 50 feet wide and 70 feet long. Make a drawing of it, letting one inch represent 10 feet. How long and how wide must the drawing be?

8. Measure your living room at home to the nearest yard. Make a drawing of it, letting one inch represent one yard.

9. Tell stories about making drawings of other things, and what you would make one inch represent in each case.

See page 333



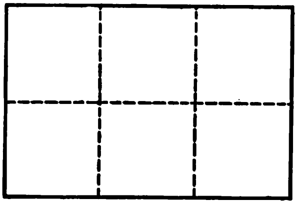
The children have been making fudge. They cut the fudge into inch squares.

ORAL AND WRITTEN EXERCISES

1. How many inches long is this pan? How many inches wide is it?

2. How many pieces of fudge are there in the pan? Can you tell without counting them? How?

A four-sided figure with square corners is called a **rectangle.**



3. Draw a rectangle 3 inches long and 2 inches wide. Into how many square inches can you divide it? What number fact does this represent?

4. Draw a rectangle 5 inches long and 3 inches wide. How many square inches are there in it? Can 3×5 be represented by this rectangle? 5×3?

5. Make a figure to represent 5×4 and 4×5.

6. Make a figure to represent 5×7 and 7×5.

7. How many pieces of fudge, each one inch square, can be cut from a pan 9 inches long and 5 inches wide?

8. If a rectangle is 6 inches long and 5 inches wide, how many square inches are there in it?

9. How many square inches are there in a rectangle 9 inches long and 5 inches wide? in a rectangle 10 inches long and 5 inches wide?

See page 334.

ORAL AND WRITTEN EXERCISES

1. How many working days are there in one week? in 2 weeks? in 3 weeks?

Two 6's are how many? Three 6's are how many? Four 6's are how many?

Read the following and supply the missing numbers:

2. $6+6=?$
$2\times6=?$

3. $12+6=?$
$3\times6=?$

4. $18+6=?$
$4\times6=?$

5. $24+6=?$
$5\times6=?$

6. $30+6=?$
$6\times6=?$

7. $36+6=?$
$7\times6=?$

8. $42+6=?$
$8\times6=?$

9. $48+6=?$
$9\times6=?$

10. $54+6=?$
$10\times6=?$

11. Count to 60 by 6's, beginning with 6.

12. How many 6's are there in 18? in 36? in 54? in 42? in 24? in 30? in 48? in 12?

13. Write the table of 6's, beginning with 6×1, 6×2.

Supply the missing numbers in the following:

14. $?\times4=4$
$2\times?=8$
$3\times?=12$
$?\times4=16$

15. $1\times6=?$
$2\times6=?$
$?\times6=18$
$?\times6=24$

16. $5\times?=20$
$6\times4=?$
$7\times?=28$
$?\times4=32$

17. $5\times6=?$
$6\times?=36$
$?\times6=42$
$9\times?=54$

New Number Facts

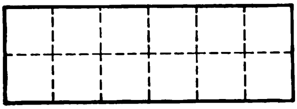
$6\times6=36$
$7\times6=42$
$8\times6=48$
$9\times6=54$
$10\times6=60$

18. $9\times4=?$
$10\times?=40$
$?\times4=28$
$8\times?=32$

19. $?\times6=60$
$8\times6=?$
$?\times4=20$
$4\times?=24$

20. $8\times?=48$
$?\times6=54$
$?\times6=60$
$6\times?=42$

See page 334.



The number fact $2\times6=12$ in the table of 6's is also in the table of 2's. In that table it reads, $6\times2=12$.

From the rectangle in the margin we see that six 2's is the same as two 6's. That is, $2\times6=6\times2$.

ORAL AND WRITTEN EXERCISES

1. What number fact in the table of 6's is also in the table of 3's?

   Draw a rectangle to show that $3\times6=6\times3$.

2. What number fact in the table of 6's is also in the table of 4's?

   Draw a rectangle to show that $4\times6=6\times4$.

3. Make a list from all the tables you have studied of those number facts which cause you the most trouble. Practice on these until you know them well.

$4\times6=24$
$6\times4=24$
$24\div4=6$
$24\div6=4$
$\frac{1}{4}$ of $24=6$
$\frac{1}{6}$ of $24=4$

From the number fact $4\times6=24$, we know at once the five other number facts printed directly under it. It is important to understand this clearly, for if we do we shall have to remember only the first one of these six. Every number fact given in the tables carries with it *related* number facts of this kind.

4. Write all the number facts *related* to each number fact in the table of 6's.

5. Make a set of question cards and answer cards for the table of 6's like those shown on page 103. Then play the game described on that page.

See page 334.

WRITTEN EXERCISES

Subtract and test each remainder:

1. 1397 898 499	2. 4360 1298 3062	3. 7542 2789 4753	4. 3410 1986 1424
5. 27400 19086 8314	6. 19270 4365 14905	7. 8024 3698 4326	8. 4281 2814 1467
9. 7602 4794 2808	10. 2067 1428 639	11. 6027 4631 1396	12. 3942 2786 1156
13. 8340 2764 5576	14. 6271 4309 1962	15. 4012 2713 1299	16. 1247 464 783
17. 24241 12674 11567	18. 14005 8427 5578	19. 5021 2598 2423	20. 4728 2060 2668
21. 2593 1287 1306	22. 4385 1847 2538	23. 5034 2728 2306	24. 80040 46829 33211

Example. From $5.60 subtract $1.85.

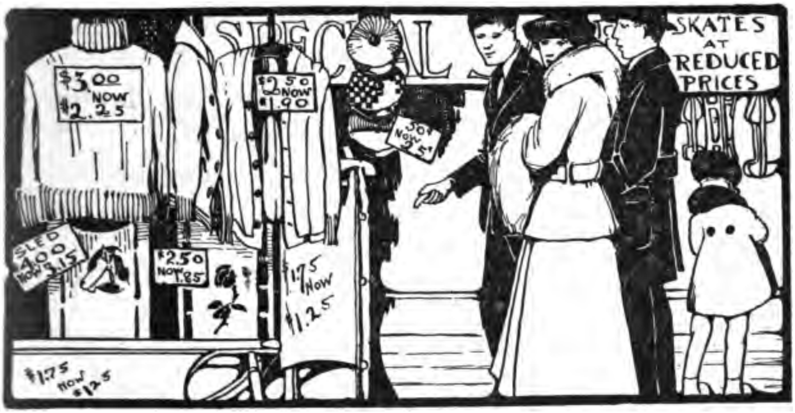
$5.60 1.85 $3.75	Subtract 185 from 560 in the usual way and then place a decimal point in the remainder directly below the decimal point in the subtrahend and minuend.

Subtract and test each remainder:

$6.00 2.45 $3.55	$3.92 1.46 $2.46	$5.35 2.75 $2.60	$8.25 4.50 $3.75	$6.45 2.65 $3.80
$7.90 4.85 $3.05	$5.25 2.68 $2.57	$12.40 6.75 $5.65	$15.00 8.50 $6.50	$10.00 4.85 $5.15

Play the game on page 91, using subtraction problems.

See page 335.



ORAL AND WRITTEN EXERCISES

Work as many of these problems as you can without using pencil and paper.

1. How much has each sled been reduced in price? How do you find out?

2. How much has the $3.00 sweater been reduced?

3. Roy's father bought him a sled for $1.85, a sweater for $1.90, and a cap for 25¢. How much did he pay for all these? How do you find out? How much change did he get from a five-dollar bill? **$4.00; $1.00**

4. George bought a pair of skates for $1.40, a sweater for $1.90, and a cap for 25 cents. How much did these cost him? How much change did he get from a five-dollar bill? **$3.55; $1.45**

5. Jane's mother bought her a sled for $3.15, a sweater for $2.25 and a pair of mittens for 25 cents. What change did she get from a ten-dollar bill? How do you find out? **$4.35**

6. Decide how you would spend $5.00 at this store.

See page 335.

CHAPTER III

MULTIPLICATION

Problem. Charlie worked 21 examples each day for 4 days. How many examples did he work in all?

$$\boxed{\begin{array}{r}21\\21\\21\\21\\\hline 84\end{array}}$$

The number of examples may be found by adding four 21's. But it may be found more quickly by *multiplying* 21 by 4.
Instead of adding four 1's we say 4×1=4.
Instead of adding four 2's, we say 4×2=8.

$$\boxed{\begin{array}{r}21\\4\\\hline 84\end{array}}$$

> In 4×21=84, 4 is called the **multiplier**, 21 is called the **multiplicand** and 84 the **product.**

Example 1. How many are three 42's, or 3×42?

42 (multiplicand) *Ones:* 3×2=6. Write *6.*
3 (multiplier) *Tens:* 3×4=12. Write *12.*
126 (product)

Also solve this problem by adding. Notice in what ways adding and multiplying are alike.

Example 2. Multiply 36 by 4.

36 (multiplicand) *Ones:* 4×6=24. Write *4*, carry 2.
4 (multiplier) *Tens:* 4×3=12, 12+2 (carried)=14.
144 (product) Write *14.*

WRITTEN EXERCISES

In this way multiply the following:

23	32	52	61	51	43	52	72
2	4	3	5	6	3	4	3
46	**128**	**156**	**305**	**306**	**129**	**208**	**216**
24	16	27	46	72	64	61	77
3	6	4	5	2	5	6	6
72	**96**	**108**	**230**	**144**	**320**	**366**	**462**

See page 335.

Example. Multiply $.46 by 5.

$.46 5 $2.30	Multiply 46 by 5 as on the opposite page and place a decimal point in the product directly under the decimal point in the multiplicand. Write the sign $ before the product.

WRITTEN EXERCISES

Multiply the following:

1.	$.38	$.49	$.98	$.64	$.91
	5	4	6	3	6
	$1.90	**$1.96**	**$5.88**	**$1.92**	**$5.46**
2.	$.55	$.79	$.87	$.40	$.77
	4	6	5	6	3
	$2.20	**$4.74**	**$4.35**	**$2.40**	**$2.31**
3.	$.54	$.34	$.43	$.23	$.36
	8	6	7	9	6
	$4.32	**$2.04**	**$3.01**	**$2.07**	**$2.16**

PROBLEMS

1. At $.35 a pound, what is the cost of 5 pounds of butter? At this price, what is the cost of 8 pounds of butter? **$1.75; $2.80**

2. John sold 6 Belgian hares at $.75 apiece. How much did he get for them? **$4.50**

3. How many days do you go to school in a school year of 38 weeks? **190**

4. If you spend 5 hours in school each day how many hours do you spend in school in 10 days? in 20 days? in 48 days? in 65 days? **50; 100; 240; 325**

5. How many quarts are there in 6 gallons? in 12 gallons? in 24 gallons? **24; 48; 96**

6. Each child in a class of 32 worked 6 examples. How many did they work all together? **192**

See page 336.

ORAL EXERCISES

1. Roy buys 4 six-cent valentines. How much do they cost? What change does he get from a quarter?

2. Belle buys 7 four-cent valentines. How much do they cost? How much change does she get from three dimes?

3. Fanny buys 3 four-cent valentines. How much do they cost? What change does she get from 15¢?

4. Jane and Mary are sisters. Together they buy 9 six-cent valentines. How much do they cost?

5. Ethel sold 5 eight-cent valentines. How much does she get for them?

6. How much did she get for 8 four-cent valentines? for 6 seven-cent valentines? for 9 five-cent valentines? for 7 six-cent valentines?

7. Make up some stories about buying and selling valentines.

8. How many three-cent valentines can you buy for a quarter? What would be your change? How many four-cent valentines can you buy for a quarter?

See page 336.

Loaf of bread	5¢	*Half-pint of cream*	15¢
A dozen eggs	35¢	*Cake of soap*	5¢
A quart of milk	9¢	*Pound of butter*	38¢

ORAL EXERCISES

1. At the prices given above, how much must you pay for a loaf of bread and a quart of milk? What change should you get from 15 cents?

2. If you buy a dozen eggs, how much change should you get from 50 cents?

3. How much must you pay for a dozen eggs and a half-pint of cream? How much change would you get from a dollar?

4. How much must you pay for 2 quarts of milk? What change should you get from a quarter?

5. If you buy a pound of butter, how much change should you get from a half-dollar?

6. How much must you pay for one quart of milk and a half-pint of cream? How much change should you get from a quarter?

7. How much must you pay for a cake of soap and a pound of butter? How much change should you get from a half-dollar?

8. How much must you pay for a dozen eggs and a loaf of bread? How much change should you get from a half-dollar?

9. How much must you pay for one dozen eggs and 2 cakes of soap? How much change should you get from a half-dollar?

See page 336.

FEBRUARY, 1919

Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
-	-	-	-	-	-	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	-

ORAL AND WRITTEN EXERCISES

1. How many days are there in one week? In two weeks? In three weeks? In four weeks?

2. Read and supply the missing numbers:

$7+7=?$ $14+7=?$ $21+7=?$
$2\times7=?$ $3\times7=?$ $4\times7=?$

$28+7=?$ $35+7=?$ $42+7=?$
$5\times7=?$ $6\times7=?$ $7\times7=?$

$49+7=?$ $56+7=?$ $63+7=?$
$8\times7=?$ $9\times7=?$ $10\times7=?$

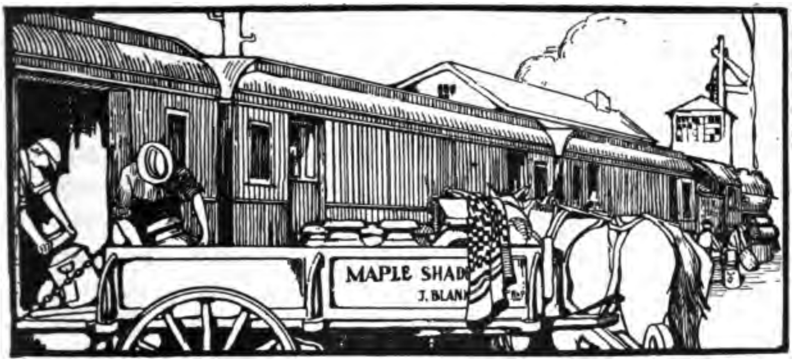
3. Draw a rectangle to show that $2\times7=7\times2$.
Draw rectangles to show that $3\times7=7\times3$, $4\times7=7\times4$, and so on.

New Number Facts
$7\times7=49$ $9\times7=63$
$8\times7=56$ $10\times7=70$

4. Write the table of 7's beginning with 7×1, 7×2, and so on.

5. How many weeks are there in 42 days? In 63 days? In 56 days? In 35 days? In 49 days? In 28 days? In 21 days?

See page 336.



People who live in the city have their milk shipped in every day from the country. The farmers haul milk to the railway station every day of the week.

ORAL AND WRITTEN EXERCISES

1. If a farmer delivers 9 cans of milk every day, how many cans does he deliver in one week of 7 days?

2. One farmer delivers 6 cans of milk every day. How many does he deliver in 7 days? In 9 days? In 30 days?

3. One farmer lives 4 miles from the station. How far does he drive each day in delivering his milk? How far does he drive in one week?

4. A farmer delivers 7 cans of milk each containing 8 gallons. How many gallons is this? How many quarts? 56; 224

5. When the train reaches the city there are 156 cans in the first car, 162 in the second, and 149 in the third. How many cans of milk does this train bring to the city? 467

6. A certain farmer delivers 53 cans of milk at the station in one week. How many gallons of milk is this if each can contains 8 gallons? 424

See page 337.

WRITTEN EXERCISES

Add and check by adding each column both ways:

1. 491	2. 715	3. 346	4. 823	5. 419
562	394	810	384	683
894	837	273	35	534
642	406	435	927	262
366	12	674	43	547
2955	2364	2538	2212	2445

6. 743	7. 391	8. 746	9. 897	10. 978
564	728	689	648	698
928	473	743	759	476
296	241	468	642	542
2531	1833	2646	2946	2694

Subtract and test each remainder:

1. 947	2. 876	3. 642	4. 754	5. 773
489	382	253	462	298
458	494	389	292	475

6. 843	7. 978	8. 789	9. 643	10. 543
597	548	296	482	345
246	430	493	161	198

11. 643	12. 781	13. 549	14. 923	15. 376
195	394	178	778	198
448	387	371	145	178

Multiply:

1. 32	2. 65	3. 28	4. 75	5. 23	6. 26
4	3	2	3	7	5
128	195	56	225	161	130

7. 78	8. 47	9. 39	10. 52	11. 64	12. 83
6	4	5	7	6	3
468	188	195	364	384	249

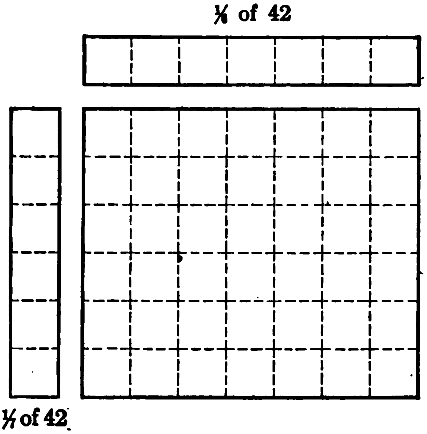
13. $.25	14. $.28	15. $.15	16. $.36	17. $.56
3	5	6	4	3
$.75	$1.40	$.90	$1.44	$1.68

See page 337.

ORAL EXERCISES

1. In the large rectangle how many rows of squares are there? How many columns? How many squares?

2. The long, narrow rectangle to the left is equal to what part of the large rectangle? $\frac{1}{7}$ of 42 is how many?



3. The long narrow rectangle above the large one is what part of the large rectangle? $\frac{1}{6}$ of 42 is how many?

4. If the large rectangle is divided into 6 equal parts, how many squares are there in each part? Point to one of these parts. $42 \div 6 =$ how many?

5. In the same way show $42 \div 7$.

The above shows the number facts *related* to the number fact, $7 \times 6 = 42$; namely, 6×7, $\frac{1}{7}$ of 42, $\frac{1}{6}$ of 42, $42 \div 6$, $42 \div 7$.

$7 \times 6 = 42$
$6 \times 7 = 42$
$\frac{1}{7}$ of $42 = 6$
$\frac{1}{6}$ of $42 = 7$
$42 \div 7 = 6$
$42 \div 6 = 7$

WRITTEN EXERCISES

Give the number facts related to each of the following: 4×7, 9×7, 3×7, 5×7. Draw a figure for each.

Drill in Fundamentals. Play a game like the one on page 71. The teacher reads combinations from the tables, such as 7×4. The children write down the product of each one and also all the number facts *related* to each one.

See page 337.

ORAL EXERCISES

You should now be able to give sums of the following without hesitating and without making a single mistake.

1.	8	9	8	6	9	4	7	9	5
	8	5	4	5	6	7	9	9	7
2.	2	3	8	9	4	5	8	6	8
	4	3	2	4	4	5	6	6	5
3.	8	7	7	8	4	3	2	5	3
	7	6	7	5	6	8	9	3	2
4.	7	4	2	6	3	6	2	5	2
	3	3	7	3	9	2	5	4	2

5. Add 8 to each of the following numbers: 35, 47, 28, 56, 89, 72, 63, 24, 67, 49, 89, 27, 45, 85, 23, 39, 85.

6. Add 9 to each of the following numbers: 13, 47, 52, 38, 44, 89, 75, 66, 18, 29, 62, 49, 83, 34.

7. Add 7 to each of the following numbers: 45, 27, 43, 59, 84, 68, 76, 53, 89, 78, 67, 54, 36, 45, 58.

WRITTEN EXERCISES

See how long it takes you to copy and subtract the following, writing neat figures and testing each result:

1. 643	2. 842	3. 731	4. 641	5. 834
456	384	448	388	568
187	458	283	253	266
6. 3512	7. 2512	8. 1816	9. 4642	10. 1746
1437	2296	1489	2489	1331
2075	216	327	2153	415
11. 4250	12. 8545	13. 2768	14. 5432	15. 6471
2450	3728	1938	2435	2984
1800	4817	830	2997	3487

See page 337.

The expression $6\times4+2$ means that we are to take $6\times4=24$ and add 2 to it.

That is, $6\times4+2=24+2=26$.

In finding this result think 24, 26 at once without thinking the rest of the process.

To find $7\times8+5$ think 56, 61.

Combinations like these are needed in multiplying, and you should learn to find the results rapidly.

ORAL EXERCISES

Read and supply the missing numbers:

$3\times4+1=?$
$7\times6+4=?$
$8\times4+3=?$
$7\times5+2=?$
$6\times8+4=?$
$8\times7+5=?$
$4\times7+2=?$
$6\times9+4=?$
$7\times9+6=?$
$5\times9+6=?$
$7\times8+7=?$
$6\times9+3=?$

$5\times6+2=?$
$4\times5+3=?$
$6\times7+4=?$
$3\times4+2=?$
$7\times7+5=?$
$2\times3+4=?$
$6\times7+8=?$
$2\times2+1=?$
$4\times9+5=?$
$4\times4+3=?$
$5\times5+2=?$
$6\times6+4=?$

$2\times7+1=?$
$8\times3+5=?$
$5\times9+6=?$
$9\times2+8=?$
$8\times4+6=?$
$7\times5+6=?$
$9\times4+8=?$
$6\times4+3=?$
$7\times3+4=?$
$9\times3+6=?$
$7\times4+5=?$
$8\times3+7=?$

Multiply:

WRITTEN EXERCISES

34	45	82	53	45	36	42	53
3	6	7	5	4	6	7	3
102	270	574	265	180	216	294	159
47	88	72	63	57	47	93	87
4	7	6	5	4	3	5	6
188	616	432	315	228	141	465	522

See page 337.

ORAL AND WRITTEN EXERCISES

1. Supply the missing numbers in the following:

8+8=? 16+8=? 24+8=?
2×8=? 3×8=? 4×8=?

32+8=? 40+8=? 48+8=?
5×8=? 6×8=? 7×8=?

56+8=? 64+8=? 72+8=?
8×8=? 9×8=? 10×8=?

New Number Facts
8×8=64 9×8=72 10×8=80

2. How many 8's are there in 32? In 16? In 40? In 24? In 48? In 64? In 80? In 72?

3. Count by 8's from 8 to 80.

4. Draw a figure to show that 2×8=8×2.

5. Draw a figure to show that 7×8=8×7.

6. Use a figure like that on page 133 to show the product 7×8 and also to show the related number facts 1/7 of 56, 1/8 of 56, 56÷7, and 56÷8.

7. Give the number facts related to each of the products: 6×8, 5×8, 9×8, 8×8, 3×8, 4×8, 10×8.

8. Write the table of 8's, beginning with 8×1, 8×2, and so on.

Multiply the following:

9.	84	37	43	97	58	78	43	73
	8	6	7	8	5	7	4	8
	672	222	301	776	290	546	172	584
10.	53	57	49	32	76	64	59	45
	5	6	8	8	7	6	4	7
	265	342	392	256	532	384	236	315

See page 338.

ORAL EXERCISES

1. The teacher asks Mary to find two numbers whose product is 10. Mary says 2×5 = 10. Is this right?

2. The teacher asks Jane to find two numbers whose product is 21. Jane says 7×3 = 21. Is this right?

3. Find two numbers whose product is 6.

4. Find two numbers whose product is 14.

5. Find two numbers whose product is 15.

6. For each of the following numbers, give two numbers of which it is the product. If you know the multiplication tables well as far as you have studied them you will be able to do this very rapidly.

4, 8, 9, 10, 14, 21, 27, 28, 32, 35, 42,
45, 48, 49, 50, 56, 60, 63, 64, 70, 72, 80.

Since 4×6 = 24, and 3×8 = 24, we see that 24 is the product of 4 and 6 and also of 3 and 8.

Again, 12 = 2×6 and also 12 = 3×4.

7. For each of the following numbers find two pairs of numbers whose product it is: 12, 16, 18, 20, 24, 36, 40.

WRITTEN EXERCISES

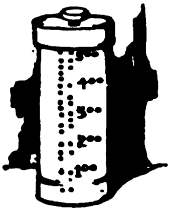
Multiply:

94	67	48	37	93	75	82	69
8	7	6	5	4	7	6	5
752	**469**	**288**	**185**	**372**	**525**	**492**	**345**

Drill in Fundamentals. Play a game like that on page 71. The teacher will read numbers from the list under Example 6. For each such number the children will write a pair of numbers of which it is the product.

See page 338.

Ralph wants to save money to buy a camera which costs $5.00. His bank holds just that amount in dimes.



ORAL AND WRITTEN EXERCISES

1. How many dimes are there in 1 dollar? in 2 dollars? in 3 dollars? in 4 dollars? in 5 dollars?
2. How many dollars and cents are there in 12 dimes? in 17 dimes? in 24 dimes? in 38 dimes?
3. How many dimes does Ralph's bank hold?
4. The first month Ralph puts 14 dimes into the bank. How many dollars and cents is this? How much more must he get to have $5.00? How do you find out?

$$\begin{array}{r} \$5.00 \\ \underline{1.40} \end{array}$$

5. Two months later Ralph has twenty-seven dimes. How many dollars and cents is this? How many more dollars and cents must he get to have $5.00?
6. When Ralph has 38 dimes, how many dollars and cents has he? How many dollars and cents does he lack to fill the bank?
7. When Ralph has 47 dimes, how many dollars and cents has he? How much does he lack?
8. After buying the camera Ralph gets a case for $1.25 and films for 50 cents. How much do the camera, case, and films cost altogether? How do you find out?
9. On Arbor Day Ralph took 12 pictures, and paid 4 cents apiece for getting them developed and printed. How much did these pictures cost him for developing and printing?
10. For July 4th Ralph bought 3 rolls of films for 25 cents each. How much did these cost?

See page 338.

ORAL AND WRITTEN EXERCISES

1. How much is the fare on a street car?
2. How much will it cost to go down town and back again?
3. How much car-fare does Mr. Smith pay each week of 6 days going to and from his office?
4. How much does one of Mr. Smith's children pay going to and from school each day, if the fare for a child is 3 cents each way? How much car-fare do the two children pay in one day?
5. At 12 cents a day, how much do these children pay each week (5 days) when they go to school?
6. Mr. Thomas lives in a small town 18 miles from the city. How far does he ride on the train going to the city and back again? How do you find out?
7. If Mr. Thomas pays 32 cents fare for one round trip, how much fare does he pay in one week, if he goes to the city 6 times? **$1.92**
8. In one month Mrs. Thomas makes 8 trips to the city. How much fare does she pay in all if she pays 43 cents for each trip? **$3.44**
9. Tell number stories about paying street-car fare.
10. See if you can find out why Mrs. Thomas pays higher fare on the train than does Mr. Thomas.

See page 339.

ORAL EXERCISES

1. At 8 cents apiece, how much do 6 grapefruits cost?

2. John lives 4 blocks from the schoolhouse. How many blocks does he walk each day going to school and back again? How many blocks does he walk in 2 days? In 5 days? In 7 days?

3. A man gives 8 cents to each of his 4 children. How many cents does he give to all of them?

4. A lady pays $42 for 6 dining-room chairs. How much does each chair cost?

5. At $72 for 8 parlor chairs, how much does one chair cost?

6. In a schoolroom there are 6 rows of desks with eight desks in each row. How many desks are there in the room?

7. Spelling books are sold for 7 cents apiece. How much do 7 children pay for their spellers?

8. At 7 cents apiece, how many spellers can be bought for 63¢? How many for 56¢?

9. If John has 32 marbles and you have one-fourth as many, how many have you?

10. A motor boat goes 8 miles an hour. How far can it go in 6 hours? In 9 hours?

11. A man having 36 cows, sells $\frac{1}{4}$ of them. How many does he sell?

12. A girl having 25 cents spends $\frac{1}{5}$ of it for candy, how much does she spend for candy? How much change does she get from the quarter?

See page 339.

James had a garden in which he worked after school.

ORAL AND WRITTEN EXERCISES

1. James bought 3 packages of lettuce seed at 5 cents a package, 3 packages of radish seed at 5 cents a package, 1 pound of onion sets for 15 cents, and 1 package of beet seed at 5 cents a package. How much did he pay for lettuce seed? How much did he pay for radish seed? How much did he pay for all these?

Lettuce seed..	15¢
Radish seed...	15¢
Onion sets....	15¢
Beet seed.....	5¢
	50¢

2. He bought these tools: a hoe for 60 cents, a rake for 50 cents, a hand weeder for 15 cents, and a watering can for 40 cents. How much did his tools cost him? **$1.65**

3. James worked from Tuesday afternoon to Friday afternoon, one hour each day, spading his garden. In how many hours did he do the spading? If his time is worth 5¢ an hour, how much did the spading amount to? **4; 20¢**

4. James began his planting at 9 o'clock Saturday morning, and finished at 12 o'clock noon. At 5¢ an hour, how much did the planting amount to?

5. He spent one hour each day except Sunday taking care of the garden. At 5¢ an hour, how much did this amount to in one week?

6. At 30 cents a week how much will the care of the garden amount to in 3 weeks? in 4 weeks?

See page 339.

ORAL AND WRITTEN EXERCISES

1. Read and supply the missing numbers in the following:

$9+9=?$ $18+9=?$ $27+9=?$
$2\times9=?$ $3\times9=?$ $4\times9=?$

$36+9=?$ $45+9=?$ $54+9=?$
$5\times9=?$ $6\times9=?$ $7\times9=?$

$63+9=?$ $72+9=?$ $81+9=?$
$8\times9=?$ $9\times9=?$ $10\times9=?$

2. How many 9's are there in 36? in 54? in 72? in 27? in 18? in 45? in 63? in 90? in 81?

New Number Facts
$9\times9=81$ $10\times9=90$

3. Count by 9's from 9 to 90.

4. Draw a figure to show that $2\times9=9\times2$.

5. Draw a figure to show that $5\times9=9\times5$.

6. Use a figure like that on page 133 to show $\frac{1}{6}$ of 54, $\frac{1}{9}$ of 54, $54\div6$, $54\div9$.

7. Give the number facts related to each of the products: 9×9, 4×9, 8×9, 6×9, 2×9.

8. Give the number facts related to each of the products: 7×9, 5×9, 3×9.

9. Write the table of 9's, beginning with 9×1, 9×2, and so on.

10. In what other tables do we find 2×9 (9×2)? In what table do we find 3×9 (9×3)?

11. In what other tables do we find the combinations 4×9, 5×9, 6×9, 7×9, 8×9?

12. Play a game like that on page 103, using the table of 9's.

See page 339.

ORAL EXERCISES

1. Measure a yardstick with a foot-rule to see how many feet make a yard.

2. Draw on the board a square one yard on each side. Into how many square feet can you divide it?

Nine **square feet** = one **square yard**
(9 sq. ft. = 1 sq. yd.)

3. How many square feet are there in 5 square yards? In 3 sq. yd.? In 2 sq. yd.?

4. How many square feet are there in 9 sq. yds.? In 7 sq. yds.? In 4 sq. yds.?

5. How many square feet are there in 6 sq. yds.? In 8 sq. yds.? In 10 sq. yds.?

6. How many square yards are there in 18 sq. ft.? In 36 sq. ft.? In 81 sq. ft.? In 63 sq. ft.? In 45 sq. ft.? In 72 sq. ft.? In 27 sq. ft.? In 54 sq. ft.?

7. Supply the missing numbers in the following:

$8\times8+6=?$
$9\times6+5=?$
$7\times8+3=?$
$8\times4+6=?$
$7\times7+4=?$
$8\times2+3=?$
$3\times7+2=?$
$6\times7+4=?$
$6\times5+4=?$
$3\times9+2=?$
$4\times7+1=?$
$4\times3+1=?$

$9\times9+6=?$
$5\times3+2=?$
$6\times3+4=?$
$7\times3+3=?$
$4\times6+2=?$
$9\times3+5=?$
$6\times5+3=?$
$6\times6+3=?$
$6\times7+4=?$
$7\times7+4=?$
$3\times3+1=?$
$8\times7+5=?$

$8\times9+5=?$
$4\times4+2=?$
$9\times2+6=?$
$8\times3+5=?$
$7\times4+5=?$
$8\times4+6=?$
$7\times5+4=?$
$9\times4+8=?$
$9\times5+6=?$
$8\times6+5=?$
$9\times6+7=?$
$8\times8+3=?$

See page 342

Multiply:

WRITTEN EXERCISES

1.	63	49	98	32	76	25	98	82
	8	6	9	8	7	9	6	64
	504	**294**	**882**	**256**	**532**	**225**	**588**	**492**
2.	98	79	91	73	47	75	47	64
	4	6	8	6	3	9	7	5
	392	**474**	**728**	**438**	**141**	**675**	**329**	**320**
3.	87	96	48	54	76	73	86	97
	2	8	4	9	7	8	5	9
	174	**768**	**192**	**486**	**532**	**584**	**430**	**873**

Multiply 847 by 6.

847 *Ones:* $6\times7=42$. Write *2*, carry 4.
6 *Tens:* $6\times4=24$, $24+4$ (carried) $=28$. Write *8*, carry 2.
5082 *Hundreds:* $6\times8=48$, $48+2$ (carried) $=50$. Write *50*.
The product is 5082.

WRITTEN EXERCISES

In this manner multiply the following:

1.	497	2.	537	3.	839	4.	691	5.	386
	6		8		4		8		4
	2982		**4296**		**3356**		**5528**		**1544**
6.	978	7.	129	8.	173	9.	765	10.	249
	6		8		4		7		9
	5868		**1032**		**692**		**5355**		**2241**
11.	2543	12.	784	13.	925	14.	4287	15.	983
	3		6		7		2		9
	7629		**4704**		**6475**		**8574**		**8847**
16.	768	17.	819	18.	693	19.	2176	20.	847
	8		7		9		4		5
	6144		**5733**		**6237**		**8704**		**4235**
21.	726	22.	493	23.	871	24.	396	25.	576
	5		7		8		6		7
	3630		**3451**		**6968**		**2376**		**4032**

See page 342.

ORAL EXERCISES

Read the following and supply the missing numbers:

1. $8 \times ? = 72$
$7 \times ? = 35$
$10 \times ? = 90$
$9 \times ? = 72$
$? \times 9 = 54$

2. $8 \times 9 = ?$
$? \times 6 = 42$
$9 \times ? = 63$
$? \times 5 = 25$
$9 \times 7 = ?$

3. $? \times 6 = 48$
$? \times 6 = 54$
$? \times 7 = 56$
$? \times 5 = 40$
$3 \times ? = 27$

4. $4 \times ? = 36$
$4 \times ? = 28$
$? \times 4 = 12$
$5 \times ? = 20$
$5 \times ? = 30$

5. $8 \times ? = 32$
$? \times 10 = 80$
$8 \times ? = 48$
$? \times 5 = 35$
$? \times 6 = 36$

6. $9 \times 6 = ?$
$? \times 6 = 30$
$? \times 9 = 81$
$8 \times 9 = ?$
$? \times 4 = 32$

7. $6 \times 9 = ?$
$? \times 9 = 27$
$8 \times ? = 24$
$8 \times ? = 56$
$9 \times 8 = ?$

8. $9 \times 9 = ?$
$8 \times 8 = ?$
$7 \times ? = 42$
$? \times 9 = 36$
$? \times 7 = 63$

9. $? \times 7 = 70$
$10 \times ? = 60$
$8 \times ? = 64$
$6 \times ? = 24$
$? \times 7 = 49$

Try to think of a game to play, using the number combinations on this page.

Make a list of those combinations that cause the most trouble, and play a game with them.

WRITTEN EXERCISES

Multiply:

1. 247	2. 453	3. 727	4. 835	5. 943
8	7	8	9	6
1976	3171	5816	7515	5658
6. 55	7. 373	8. 85	9. 578	10. 54
5	9	8	6	9
275	3357	680	3468	486
11. 571	12. 887	13. 647	14. 499	15. 273
9	7	8	6	4
5139	6209	5176	2994	1092

See page 342.

Example 1. Multiply 34 by 26.

34 *First Step:* Multiply 34 by 6 and place first figure
26 directly under the 6.
204 6×4=24. Write *4*. Carry 2.
68 6×3=18. 18+2 (carried)=20. Write *20*.
884 *Second Step:* Multiply 34 by 2 and place first figure directly under the 2.
2×4=8. Write *8*.
2×3=6. Write *6*.
Third Step: Add the two products.

The two products 204 and 68 are called "partial products." We can then say that the third step is: "add the partial products."

Notice very carefully that the first figure in each partial product is written directly below the number with which we multiply. Thus, the first figure in the first product is written right under the 6 (in ones' place), and the first figure in the second product is written right under the 2 (in tens' place). The real reason for this is a little hard to understand, and will be given in a later book.

Example 2. Multiply 87 by 39.

87 *First Step:* State what this step is.
39 9×7=63. Write *3*. Carry 6.
783 9×8=72. 72+6=78. Write *78*.
261 *Second Step:* State what this step is.
3393 3×7=21. Write *1*. Carry 2.
3×8=24. 24+2=26. Write *26*.
Third Step: State what this step is.

Multiply: WRITTEN EXERCISES

38	62	82	76	84	59	67	89
21	54	27	38	75	87	35	34
798	3348	2214	2888	6300	5133	2345	3026

See page 342.

We know that $2\times0=0$, because $0+0=0$. For this same reason, zero multiplied by any number is zero.

Thus if there are 0 (not any) children in each room of your school on Sunday, there are 0 (not any) children in all the rooms.

Example 1. Multiply 307 by 9.

307 *Ones:* $9\times7=63$. Write *3*. Carry 6.
9 *Tens:* $9\times0=0$. $0+6$ (carried)$+6$. Write *6*.
2763 *Hundreds:* $9\times3=27$. Write *27*.

Example 2. Multiply 307 by 29.

307 Multiply by 9 as in Example 1. Then multiply by 2,
29 being careful to place the first figure of the product
2763 in tens' place. Add the products.
614
8903

WRITTEN EXERCISES

Multiply the following:

1. 408 26 10608	**2.** 506 49 24794	**3.** 308 42 12936	**4.** 405 84 34020	**5.** 607 46 27922
6. 604 95 57380	**7.** 802 69 55338	**8.** 404 75 30300	**9.** 607 84 50988	**10.** 304 47 14288
11. 456 38 17328	**12.** 592 76 44992	**13.** 876 43 37668	**14.** 207 34 7038	**15.** 196 58 11368
16. 614 86 52804	**17.** 509 34 17306	**18.** 891 29 25839	**19.** 724 13 9412	**20.** 887 47 41689
21. 397 45 17865	**22.** 814 72 58608	**23.** 647 29 18763	**24.** 584 93 54312	**25.** 692 87 60204

See page 343.

ORAL EXERCISES

1. Read the following and supply the missing numbers:

$2\times10=?$ $3\times10=?$ $4\times10=?$ $5\times10=?$
$6\times10=?$ $7\times10=?$ $8\times10=?$ $9\times10=?$

Which of these combinations have been learned in the other tables?

2. $90+10=?$ $10\times10=?$

3. How many 10's are there in 30? In 70? In 90? In 20? In 100? In 40? In 80? In 50? In 60?

New Number Fact
$10\times10=100$

4. Give the number facts related to each of the following products: 5×10, 7×10, 9×10, 4×10, 10×10.

5. Give the number facts related to each of the following products: 3×10, 8×10, 6×10.

6. How many tens are there in each of the following: 110, 120, 130, 140, 150, 160, 170, 180, 190, 200.

We notice from the tables that to multiply a number by 10 we write one zero to the right of it. That is, $10\times8=80$, $10\times7=70$, $10\times4=40$, and so on. Any number is multiplied by 10 this way. Thus, $10\times16=160$, $10\times24=240$.

7. Multiply by 10 each of the numbers 12, 13, 14, 15, 16, 17, 21, 27, 31, 40.

8. Multiply by 10 each of the numbers 37, 48, 51, 60, 73, 49, 82, 67, 85.

WRITTEN EXERCISES

Write the table of 10's beginning with 10×1, 10×2, and so on.

Play a game like that on page 103, using tables including the table of 10's.

See page 343.

ORAL EXERCISES

To multiply a number by 20, we may first multiply it by 2 and then by 10. That is, we may multiply by 2 and then annex one zero.

Thus, 20×6=10×12=120.

1. In this manner find the products of the following:

20×7, 20×9, 20×12, 20×16,
20×5, 20×4, 20× 3, 20×11.
20×6, 20×8, 20×15, 20×25.

To multiply a number by 30 we may first multiply it by 3 and then by 10; that is, we may multiply it by 3 and then annex a zero to the right.

To multiply by 40, multiply by 4 and annex one zero, and so on.

2. Give a rule for multiplying a number by 50. by 60. by 70. by 80. by 90.

Read the following and supply the missing number:

3. 40×4=?
40×5=?
40×6=?
40×7=?
40×8=?
40×9=?

4. 50×4=?
50×5=?
50×6=?
50×7=?
50×8=?
50×9=?

5. 60×4=?
60×5=?
60×6=?
60×7=?
60×8=?
60×9=?

6. 70×4=?
70×5=?
70×6=?
70×7=?
70×8=?
70×9=?

7. 80×4=?
80×5=?
80×6=?
80×7=?
80×8=?
80×9=?

8. 80×4=?
90×5=?
90×6=?
90×7=?
90×8=?
90×9=?

9. See if you can make a rule for multiplying by 200.

See page 343.

MULTIPLYING NUMBERS ENDING IN ZEROS

The multiplication of numbers ending in one or more zeros is shown in the examples on this page.

EXAMPLES

Example 1. Multiply 288 by 160.

288
160
1728
288
46080

Multiply 288 by 16 and then multiply the product by 10 by annexing one zero to the right.

Notice that the 160 is written so as to make the 6 come directly under the 8.

Example 2. Multiply 480 by 240.

480
240
1920
960
115200

Multiply 480 by 24, and then multiply the product by 10 by annexing 1 zero to the right.

Example 3. Multiply 270 by 1800.

270
1800
2160
270
486000

Multiply 270 by 18, and then multiply the product by 100 by annexing 2 zeros to the right.

Notice very carefully how the numbers are written down before we start multiplying.

Example 4. Multiply \$9.65 by 18.

\$9.65
18
7720
965
\$173.70

Multiply 965 by 18 in the usual manner. Then place a decimal point between tens' and hundreds' places, and a dollar sign before the first figure in the product.

ORAL EXERCISES

Tell how to find the products 370×600, 747×800.
See page 344.

WRITTEN EXERCISES

On the previous page you will see how these examples should be written before you start multiplying.

Multiply:

1. 384	2. 566	3. 729	4. 593	5. 365
50	35	80	70	40
19200	**19810**	**58320**	**41510**	**14600**
6. 240	7. 670	8. 380	9. 190	10. 260
80	50	90	70	60
19200	**33500**	**34200**	**13300**	**15600**
11. 890	12. 970	13. 240	14. 628	15. 907
860	300	800	76	260
765400	**291000**	**192000**	**47728**	**235820**

See how many minutes it takes you to copy and multiply the next 12 examples.

16. $7.89	17. $8.79	18. $9.08	19. $10.49
78	89	78	98
$615.42	**$782.31**	**$708.24**	**$1028.02**
20. $5.67	21. $8.35	22. $5.35	23. $9.45
24	45	64	59
$136.08	**$375.75**	**$342.40**	**$557.55**
24. $7.29	25. $4.05	26. $7.63	27. $6.87
35	47	38	56
$255.15	**$190.35**	**$289.94**	**$384.72**

Add:					
	28. 762	29. 139	30. 859	31. 230	32. 126
	895	247	243	680	387
	347	380	672	254	258
	653	436	294	623	342
	609	278	288	810	573
	432	540	642	390	619
	891	270	590	582	284
	4589	**2290**	**3588**	**3569**	**2589**

See page 344.

WRITTEN EXERCISES

1. This farmer has 5 horses, which are worth $175.00 apiece. How much are all the horses worth? How do you find out? **$875.00**
2. The farmer has 27 cows worth $75 apiece. How much are these cows worth? How do you find out? **$2025.00**
3. During March and April his hens laid 3 dozen eggs each day. How many dozen did they lay in two months of 61 days? **183**
4. At 22 cents a dozen, how much are 183 dozen eggs worth? **$40.26**
5. At 58 bushels to the acre, how many bushels of corn does the farmer raise on 68 acres? **3944**
6. The farmer sold 34 hogs at $21.50 apiece. How much did he get for his hogs? **$731.00**
7. The farmer hauls milk to the station. If he gets $1.36 a can for his milk, how much does he get for 8 cans? **$10.88**
8. During one month he delivered 57 cans of milk. At $1.36 a can, how much was this milk worth? **$77.52**

See page 344.

WRITTEN EXERCISES

9. The farmer sold 245 bushels of potatoes at 45 cents a bushel. How much did he get for his potatoes?

Multiply 245 by 45. Then place the dollar sign before the number and place a decimal point between tens' and hundreds' place.

$$\boxed{\begin{array}{r} 245 \\ \underline{45} \\ 1225 \\ 980 \\ \hline \$110.25 \end{array}}$$

10. At 95 cents a bushel how much did he receive for 485 bushels of wheat? **$460.75**

11. The farmer sold 985 bushels of oats at 38 cents a bushel. How much did he get for the oats? **$374.30**

12. At 57 cents a bushel how much did he receive for 535 bushels of corn? **$304.95**

13. How much did the farmer get for 9 young pigs at $5.50 apiece? **$49.50**

14. The farmer paid a hired man $1.35 a day for 84 days' work. How much did he pay the man? **$113.40**

15. A mowing machine cost $42.50, a corn harvester $115.00, and a plow $18.50. How much did all these cost? **$176.00**

16. How much more did the corn harvester cost than the mowing machine? How much more did it cost than the plow? **$72.50; $96.50**

17. The farmer spent 14 days putting up his hay. Counting the use of a team, machinery, his own time, and that of the hired man, he figured that the total value of this work was $7.85 a day. What was the total cost of putting up the hay? **$109.90**

18. The farmer began to harvest the corn 16 weeks after planting. How many days was that? **112**

19. Make other farm problems and solve them.

See page 344.

Example 1. Multiply 532 by 647.

532	*First step:* Multiply 532 by 7 and place the first
647	figure of the product directly under the 7.
3724	*Second step:* Multiply 532 by 4 and place the first
2128	figure of the product directly under the 4.
3192	*Third step:* Multiply 532 by 6 and place the first
344204	figure of the product directly under the 6.
	Fourth step: Add the partial products.

Example 2. Multiply 387 by 406.

387	*First step:* Multiply 387 by 6 and place the first
406	figure of the product directly under the 6.
2322	*Second step:* Multiply 387 by 4 and place the first
1548	figure of the product directly under the 4.
157122	*Third step:* Add the partial products.

WRITTEN EXERCISES

Multiply:

1. 897	2. 378	3. 720	4. 416
408	609	807	207
365976	230202	581040	86112
5. 356	6. 108	7. 764	8. 406
905	464	327	894
322180	50112	249828	362964
9. 204	10. 320	11. 961	12. 579
485	907	402	785
98940	290240	386322	454515
13. 578	14. 842	15. 654	16. 779
294	309	397	284
169932	260178	259638	221236
17. 547	18. 206	19. 190	20. 587
194	307	286	264
106118	63242	54340	154968
21. 475	22. 760	23. 219	24. 487
419	234	286	265
199025	177840	62634	129055

ge 345.

ORAL EXERCISES

Read and supply the missing numbers:

1. $6 \times 8 = ?$
$8 \times 6 = ?$
$6\overline{)48} = ?$
$8\overline{)48} = ?$
$\frac{1}{6}$ of $48 = ?$
$\frac{1}{8}$ of $48 = ?$

2. $9 \times 7 = ?$
$7 \times 9 = ?$
$7\overline{)63} = ?$
$9\overline{)63} = ?$
$\frac{1}{7}$ of $63 = ?$
$\frac{1}{9}$ of $63 = ?$

3. $8 \times 9 = ?$
$9 \times 8 = ?$
$8\overline{)72} = ?$
$9\overline{)72} = ?$
$\frac{1}{8}$ of $72 = ?$
$\frac{1}{9}$ of $72 = ?$

4. Give similar combinations for 6×9, 7×8, and 7×6.

Give the quotients in the following:

5. $9\overline{)36}$ $4\overline{)36}$ $5\overline{)30}$ $6\overline{)30}$ $3\overline{)21}$ $7\overline{)21}$
6. $9\overline{)81}$ $9\overline{)72}$ $8\overline{)72}$ $8\overline{)80}$ $9\overline{)90}$ $5\overline{)10}$
7. $10\overline{)90}$ $10\overline{)80}$ $10\overline{)70}$ $7\overline{)70}$ $10\overline{)100}$ $10\overline{)50}$
8. $8\overline{)56}$ $7\overline{)56}$ $6\overline{)54}$ $9\overline{)54}$ $6\overline{)60}$ $10\overline{)60}$
9. $6\overline{)48}$ $8\overline{)48}$ $5\overline{)45}$ $9\overline{)45}$ $6\overline{)42}$ $7\overline{)42}$
10. $10\overline{)40}$ $4\overline{)40}$ $5\overline{)40}$ $8\overline{)40}$ $6\overline{)36}$ $4\overline{)32}$
11. $8\overline{)32}$ $3\overline{)30}$ $10\overline{)30}$ $4\overline{)28}$ $7\overline{)28}$ $3\overline{)27}$
12. $9\overline{)27}$ $6\overline{)24}$ $4\overline{)24}$ $3\overline{)24}$ $8\overline{)24}$ $6\overline{)18}$

Supply the missing numbers in the following:

13. $\frac{1}{6}$ of $54 = ?$ $\frac{1}{9}$ of $54 = ?$ $\frac{1}{8}$ of $64 = ?$ $\frac{1}{7}$ of $49 = ?$
14. $\frac{1}{8}$ of $48 = ?$ $\frac{1}{6}$ of $48 = ?$ $\frac{1}{7}$ of $42 = ?$ $\frac{1}{6}$ of $42 = ?$
15. $\frac{1}{7}$ of $63 = ?$ $\frac{1}{9}$ of $63 = ?$ $\frac{1}{9}$ of $72 = ?$ $\frac{1}{8}$ of $72 = ?$
16. $\frac{1}{8}$ of $32 = ?$ $\frac{1}{4}$ of $32 = ?$ $\frac{1}{7}$ of $28 = ?$ $\frac{1}{4}$ of $28 = ?$
17. $\frac{1}{6}$ of $18 = ?$ $\frac{1}{3}$ of $18 = ?$ $\frac{1}{7}$ of $21 = ?$ $\frac{1}{3}$ of $21 = ?$

See page 345.

ORAL EXERCISES

1. How many pounds do you weigh?

2. How much does the heaviest child in your class weigh? How much more than you does this child weigh?

3. Who is the lightest child in your class? How much less than you does this child weigh?

4. If you gain on an average 8 pounds a year from now until you are 18 years old, how much will you weigh then? At this rate of gain, how much will the heaviest child in your class weigh when 18 years old?

One **pound** = 16 **ounces** (1 lb. = 16 oz.)

5. How many ounces are there in 2 pounds? in 3 pounds? in 4 pounds? in ½ pound? in ¼ pound?

6. If a baby gains on an average 4 ounces each week, how long will it take it to gain one pound?

7. How long will it take this baby to gain five pounds?

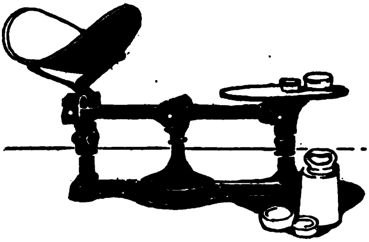
8. How much will the baby gain in one month (4 weeks)? in 4 months of four weeks each? in 10 months of four weeks each? in 12 months of four weeks each?

9. How much will a baby weigh when it is one year old if it weighs 8 pounds at birth and gains (on an average) 4 ounces a week (one pound in four weeks)?

Since there are 52 weeks in the year, and since 4 is contained 13 times in 52, the baby will gain how much?

See page 345.

ORAL EXERCISES



1. How many ounces are there in a half-pound of candy?

2. If candy is 40 cents a pound, how many ounces do you get for 20 cents?

If you buy candy or if you go with your mother to buy meat be sure to watch the scale to see that you get full weight. How can you tell?

3. If candy is 40 cents a pound, how much candy do you get for 10 cents?

4. If you buy candy worth 60 cents a pound, how much do you pay for 8 ounces? for 4 ounces?

5. If round steak costs 24 cents a pound, how much will one and a half pounds cost?

6. How many ounces are there in ¾ of a pound? How much is ¾ of a pound of round steak worth at 24 cents a pound?

7. If boiled ham costs 40 cents a pound, how much is 4 ounces worth? 8 ounces? 12 ounces?

8. If pecans cost 80 cents a pound, how many ounces do you get for 40 cents? for 10 cents?

9. If pecans cost 80 cents a pound, how much is one ounce worth? 3 ounces? 5 ounces?

10. If salted almonds cost $1.00 a pound, how much do 8 ounces cost? 4 ounces? 12 ounces?

11. Name other articles that are sold by the pound.

See page 345.

WRITTEN EXERCISES

Add:

1.	2.	3.	4.	5.
786	826	278	685	517
236	670	865	609	420
476	469	694	870	896
823	342	846	768	782
197	678	197	594	349
938	465	849	637	678
3456	3450	3729	4163	3642

6.	7.	8.	9.	10.
934	692	869	948	857
689	786	646	796	295
467	879	597	327	768
418	542	153	672	567
296	375	214	891	890
734	246	321	432	123
3538	3520	2800	4066	3500

Subtract

1.	2.	3.	4.	5.
4620	8734	7943	6809	8005
1786	2985	2864	3978	3647
2834	5749	5079	2831	4358

6.	7.	8.	9.	10.
6573	7890	9768	5847	5463
1984	5936	5879	2938	2958
4589	1954	3889	2909	2505

11.	12.	13.	14.	15.
8307	6495	7820	4790	7382
2768	3687	1786	2897	5090
5539	2808	6034	1893	2292

Multiply:

1.	2.	3.	4.	5.
436	368	603	947	89
57	64	86	78	68
24852	23552	51858	73866	6052

6.	7.	8.	9.	10.
840	490	674	208	680
75	49	69	37	90
63000	24010	46506	7696	61200

See page 345.

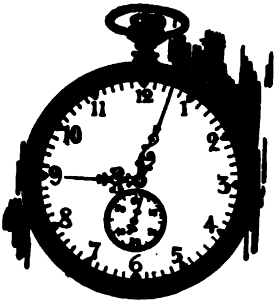
ORAL EXERCISES

Supply the missing numbers:

1.	$4\times9=?$	$36\div4=?$	$\frac{1}{4}$ of $36=?$
	$9\times4=?$	$36\div9=?$	$\frac{1}{9}$ of $36=?$
2.	$6\times7=?$	$42\div6=?$	$\frac{1}{6}$ of $42=?$
	$7\times6=?$	$42\div7=?$	$\frac{1}{7}$ of $42=?$
3.	$9\times7=?$	$63\div9=?$	$\frac{1}{9}$ of $63=?$
	$7\times9=?$	$63\div7=?$	$\frac{1}{7}$ of $63=?$
4.	$5\times9=?$	$45\div5=?$	$\frac{1}{5}$ of $45=?$
	$9\times5=?$	$45\div9=?$	$\frac{1}{9}$ of $45=?$
5.	$7\times8=?$	$56\div7=?$	$\frac{1}{7}$ of $56=?$
	$8\times7=?$	$56\div8=?$	$\frac{1}{8}$ of $56=?$
6.	$9\times8=?$	$72\div9=?$	$\frac{1}{9}$ of $72=?$
	$8\times9=?$	$72\div8=?$	$\frac{1}{8}$ of $72=?$
7.	$6\times9=?$	$54\div6=?$	$\frac{1}{6}$ of $54=?$
	$9\times6=?$	$54\div9=?$	$\frac{1}{9}$ of $54=?$
8.	$4\times7=?$	$28\div4=?$	$\frac{1}{4}$ of $28=?$
	$7\times4=?$	$28\div7=?$	$\frac{1}{7}$ of $28=?$
9.	$9\times3=?$	$27\div7=?$	$\frac{1}{9}$ of $27=?$
	$3\times9=?$	$27\div3=?$	$\frac{1}{3}$ of $27=?$
10.	$3\times7=?$	$21\div3=?$	$\frac{1}{3}$ of $21=?$
	$7\times3=?$	$21\div7=?$	$\frac{1}{7}$ of $21=?$
11.	$8\times4=?$	$32\div8=?$	$\frac{1}{8}$ of $32=?$
	$4\times8=?$	$32\div4=?$	$\frac{1}{4}$ of $32=?$
12.	$6\times8=?$	$48\div8=?$	$\frac{1}{8}$ of $48=?$
	$8\times6=?$	$48\div4=?$	$\frac{1}{4}$ of $48=?$
13.	$5\times3=?$	$15\div3=?$	$\frac{1}{3}$ of $15=?$
	$3\times5=?$	$15\div5=?$	$\frac{1}{5}$ of $15=?$

See page 345.

ORAL EXERCISES



1. Which hand on the watch is called the hour hand? the minute hand? the second hand?

2. How long does it take the minute hand to go around once? How long does it take the hour hand?

3. How long does it take the second hand to go around the small circle?

4. How many minute spaces does the hour hand pass over in one hour? in 2 hours?

5. How many minute spaces does the hour hand pass over in one hour?

6. How many minutes are there in one hour?

7. How many times does the second hand go around while the minute hand goes around once?

8. How many seconds are there in one minute?

9. How many hours are there in a whole day and night?

60 **seconds** = 1 **minute** (60 sec. = 1 min.)
60 minutes = 1 **hour** (60 min. = 1 hr.)
24 hours = 1 **day** (24 hr. = 1 da.)

Instead of second or seconds we sometimes write sec., instead of minute or minutes we write min., instead of hour or hours we write hr., and instead of day or days we write da.

10. About what time do you go to bed at night? At what time do you get up?

11. A child 8 years old should get 10 hours of sleep. Do you get more or less sleep than this?

See page 346.

A CLASS—Third Grade.

Time	Studies	Recites
9 : 00– 9 : 10	Opening Exercises	
9 : 10– 9 : 25	Reading	
9 : 25– 9 : 40		Reading
9 : 40– 9 : 55	History	
9 : 55–10 : 10		History
10 : 10–10 : 30	Arithmetic	
10 : 30–10 : 45	Recess	
10 : 45–11 : 00		Music
11 : 00–11 : 20		Arithmetic
11 : 20–11 : 40	Spelling	
11 : 40–12 : 00		Reading
	NOON	
1 : 30– 1 : 40		Spelling
1 : 40– 1 : 55		Writing
1 : 55– 2 : 15	Reading	
2 : 15– 2 : 35		Reading
2 : 35– 2 : 45	Exercises	
2 : 45– 3 : 00	Recess	
3 : 00– 3 : 30	Drawing 3 days Construction work, 2 days	

ORAL EXERCISES

1. How many minutes are there from 9 : 55 to ten o'clock? from 9 : 55 to 10 : 10?

2. How many minutes are there from 1 : 55 to 2 : 15?

3. How many minutes are given to the study of each subject in this program? to recesses? to noon?

4. How many minutes are given to recite on each subject?

See page 346.

WRITTEN EXERCISES

Copy and supply the quotients. Use the form $4\overset{3}{\overline{)12}}$

1. $6\overline{)42}$ $7\overline{)42}$ $8\overline{)56}$ $7\overline{)56}$ $7\overline{)49}$ $7\overline{)63}$

2. $8\overline{)48}$ $5\overline{)40}$ $6\overline{)48}$ $8\overline{)40}$ $4\overline{)32}$ $7\overline{)28}$

We have here 14 marks arranged in //// //// //// // 3 groups of 4 each and 2 left over. From this we see that in 14 there are three 4's and 2 over. We may also learn this without using objects, because we know there are exactly three 4's in 12, and 14 is 2 greater than 12. We say that when 14 is divided by 4 we get 3 and 2 left over. We call the 3 the *quotient* and the 2 the *remainder*.

Since there is a remainder 14 is not **exactly divisible** by 3. When there is no remainder the division is **exact**.

Example. Find the quotient and remainder when 28 is divided by 5.

$$\boxed{\begin{array}{l} \quad 5\text{, remainder } 3 \\ 5\overline{)28} \end{array}}$$

We know that $5 \times 5 = 25$, and that therefore there are exactly five 5's in 25. Since 28 is 3 greater than 25 we get 5 as the *quotient* and 3 as the *remainder*.

ORAL EXERCISES

Give the quotients and remainders in the following:

3. $6\overline{)37}$ $7\overline{)45}$ $8\overline{)36}$ $5\overline{)43}$ $2\overline{)13}$ $3\overline{)17}$

4. $9\overline{)57}$ $4\overline{)37}$ $6\overline{)27}$ $9\overline{)68}$ $8\overline{)53}$ $7\overline{)58}$

5. $6\overline{)43}$ $4\overline{)35}$ $6\overline{)57}$ $9\overline{)48}$ $8\overline{)73}$ $7\overline{)68}$

6. $7\overline{)29}$ $7\overline{)32}$ $7\overline{)38}$ $7\overline{)43}$ $7\overline{)48}$ $7\overline{)61}$

See page 346.

ORAL EXERCISES

Give the quotients and remainders:

1.	6)19	7)23	8)20	9)22	7)17
2.	6)22	5)24	7)26	8)27	9)25
3.	9)28	7)29	8)30	5)44	4)27
4.	9)31	7)32	8)34	6)35	4)30
5.	7)36	6)33	5)32	4)34	9)35
6.	8)37	7)39	9)38	6)39	9)37
7.	7)40	5)38	4)39	6)40	9)42

WRITTEN EXERCISES

Multiply:

1. 970 90 87300	2. 870 80 69600	3. 360 70 25200	4. 530 40 21200	5. 480 30 14400
6. 760 45 34200	7. 294 81 23814	8. 316 48 15168	9. 590 55 32450	10. 362 49 17738
11. \$3.97 88 \$349.36	12. \$9.47 36 \$340.92	13. \$7.48 27 \$201.96	14. \$8.94 86 \$768.84	15. \$3.76 46 \$172.96
16. \$1.47 45 \$66.15	17. \$4.90 28 \$137.20	18. \$5.68 35 \$198.80	19. \$2.25 86 \$193.50	20. \$2.50 79 \$197.50
21. \$5.45 12 \$65.40	22. \$3.65 14 \$51.10	23. \$1.85 29 \$53.65	24. \$2.45 65 \$159.25	25. \$4.89 62 \$303.18

Play a game like that on page 103. Use mixed cards from all the tables. First let the boys play against the girls. Then let one side of the room play against the other.

See page 346.

The number of days in the months of the year are:

January	31	July	31
February	28	August	31
March	31	September	30
April	30	October	31
May	31	November	30
June	30	December	31

The number of days in each month can easily be remembered when we notice that, beginning with January, every alternate month has 31 days, except that July and August both have 31 days. All the other months have 30 days, except February, which has 28 days. In a leap year, which comes every fourth year, February has 29 days.

OLD RHYME

Thirty days hath September,
April, June and November.
All the rest have thirty-one
Save February, which alone
Has twenty-eight; and one day more
We add to it each year in four.

WRITTEN EXERCISES

1. How many months of the year have 31 days each? How many days are there in all these months? **7; 217**
2. How many months of the year have 30 days each? How many days are there in all these months? **4; 120**
3. From the number of days in the months, find out how many days there are in one year.
4. Can you find how many days there are in a leap-year? How?

See page 346.

WRITTEN AND ORAL EXERCISES

1. How many days are there in 52 weeks? **364**
2. How many days less than one year is this?
3. How many weeks are there in one year? (Count only whole weeks.)
4. How many years old were you on your last birthday?
5. How many weeks old were you on your last birthday? (Count 52 weeks for each year.)
6. How many weeks do you go to school each year?
7. How many grades are there in your school?
8. If you spend one school year in each grade, how many weeks will you spend altogether in your school?
9. How many days old were you on your seventh birthday? (7×365 are how many?) **2555**
10. How many days do you go to school each week?
11. How many days do you go to school in a school year of 38 weeks if you do not miss any? **190**
12. If you miss 14 days in one year, how many days do you attend school that year? **176**
13. On an average, how many hours do you sleep each night? How many hours do you sleep in one week? in one month? in one year?
14. How many hours do you spend in school in one day? In one week of 5 school days? in a month of 20 school days?
15. If you spend 5 hours in school daily, how many hours will you spend in school during a year of 190 school days? **950**

See page 346.

ORAL AND WRITTEN EXERCISES

1. James planted his garden on May 5th. In 65 days he began to sell radishes. On what date was that? **July 9**

Make a calendar for May, June and July and count days to find the date. The teacher will show you how to make the calendar. When you get older you will learn how to find such dates with much less trouble.

2. On June 12th he began selling lettuce. How many days did it take his lettuce to grow? **38**

3. For 15 days he sold 2 bunches of radishes each day at 5 cents a bunch. How much did he get for his radishes? **$1.50**

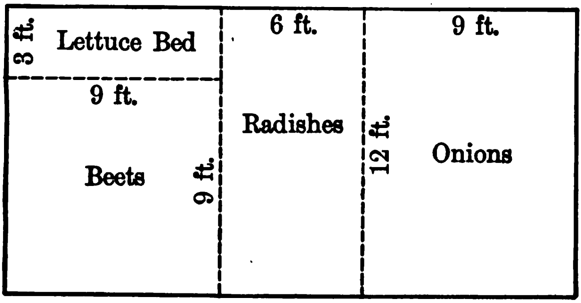
His sales of his other crops were:

Crop	Number of days	Sale each day	Price per bunch
Lettuce	26	2 bunches	5 cents
Onions	16	4 bunches	3 cents
Beet Greens	14	2 bunches	2 cents
Beets	17	3 bunches	2 cents

4. How many bunches of lettuce did he sell? How much did he get for them? **52; $2.60**

5. How many bunches of each of the other crops did he sell? How much did he get for each of these crops?

See page 346. **64, $1.92, 28, $.56, 51, $1.02**



ORAL AND WRITTEN EXERCISES

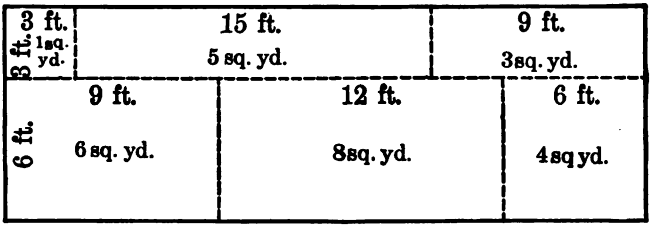
1. This is a drawing of James's garden. If his lettuce bed is 3 feet wide and 9 feet long, how many square feet are there in this bed? **27**

2. How many yards long and how many yards wide is his lettuce bed? How many square yards are there in it? **1 yd. by 3 yds.; 3 sq. yds.**

3. How many square yards are there in his onion bed? **12**

4. How many square yards are there in his radish bed? **8**

5. How large is his beets bed? **9 sq. yds.**



6. This figure represents a garden with 6 different beds in it. What is its total length? its total width? **27 ft.; 9 ft.**

7. How many square yards are there in the whole garden? How many square yards are there in each bed? **27 sq. yd.**

See page 346.

ORAL EXERCISES

1. How many things are there in one dozen?

2. What things can you think of that are sold by the dozen?

3. How many things are there in 2 dozen? in 3 dozen?

4. How many things are there in ½ of a dozen? in ⅓ of a dozen? in ⅔ of a dozen? in ¼ of a dozen? in ¾ of a dozen?

5. If eggs sell at 25 cents a dozen, how much will 6 dozen cost?

6. If oranges sell at 40 cents a dozen, how much will ½ of a dozen cost? 1½ dozen?

7. How many dozens are there in 24? in 36? in 48?

8. Six is what part of one dozen?

9. What is the cost of 6 oranges at 50 cents a dozen?

10. What is the cost of 6 lemons at 30 cents a dozen?

11. Which is more, ½ of a dozen or ⅓ of a dozen? how much?

12. Which is more, ⅓ of a dozen or ¼ of a dozen? how much?

13. At 30 cents a dozen, how much will ⅓ of a dozen cost?

14. At 40 cents a dozen, how much will ¼ of a dozen cost?

15. At 60 cents a dozen how much will ½ of a dozen cost? ¼ of a dozen?

See page 346.

WRITTEN EXERCISES

See how long it takes you to copy and work all the examples in addition on this page. Ask the teacher to time you. Then see how long it takes you to work the examples in subtraction. Your work must be neat and accurate.

Add:

1. 547	2. 1767	3. 494	4. 289	5. 876
63	48	89	76	98
781	2930	676	458	986
94	87	85	694	375
276	2865	67	77	249
89	58	384	579	99
1850	7755	1795	2173	2683
6. 5893	7. 9823	8. 7943	9. 351	10. 937
4387	786	679	69	468
36	7698	957	432	295
563	594	882	733	914
871	487	644	406	326
406	673	197	296	341
12156	20061	11302	2287	3281

Subtract:

1. 1432	2. 4321	3. 7843	4. 5932	5. 81900
876	3745	5869	4159	24095
556	576	1974	1773	57805
6. 4826	7. 5479	8. 3678	9. 8612	10. 51704
2789	587	799	3874	20908
2037	4892	2879	4738	30796
11. 4793	12. 5764	13. 4625	14. 3198	15. 14700
2898	2889	786	2739	8937
1895	2875	3839	459	5763
16. 2567	17. 4763	18. 4896	19. 4570	20. 25100
679	2876	989	2694	14108
1888	1887	3907	1876	10992

See page 347.

WRITTEN EXERCISES

See how long it takes you to copy and multiply the first 12 examples on this page.

1. 480	2. 365	3. 473	4. 504
46	36	54	67
22080	**13140**	**25542**	**33768**
5. 896	6. 706	7. 890	8. 978
48	93	47	86
43008	**65658**	**41830**	**84108**
9. 378	10. 492	11. 308	12. 587
27	67	58	34
10206	**32964**	**17864**	**19958**

13. If there are 20 rooms in your school building and 36 desks in each room, how many children will the building seat? How do you find out? **720**

14. How many children will a schoolhouse seat if it has 16 rooms and 48 desks in each room? **768**

15. A rectangle is 16 inches long and 12 inches wide. How many square inches are there in it? **192**

16. How many square feet are there in a garden 18 feet long and 15 feet wide? **270**

See how long it takes you to copy and multiply the following examples:

17. 800	18. 780	19. 394	20. 789
86	97	47	180
68800	**75660**	**18518**	**142020**
21. 670	22. 530	23. 740	24. 987
50	187	206	98
33500	**99110**	**152440**	**96726**
25. 398	26. 726	27. 891	28. 984
84	309	84	203
33432	**224334**	**74844**	**199752**

See page 347.

ORAL EXERCISES

Give quotients and remainders in the following:

1. $6\overline{)47}$ $7\overline{)48}$ $9\overline{)50}$ $8\overline{)49}$ $7\overline{)68}$

2. $5\overline{)43}$ $8\overline{)54}$ $7\overline{)53}$ $6\overline{)55}$ $4\overline{)35}$

3. $6\overline{)56}$ $8\overline{)57}$ $9\overline{)57}$ $8\overline{)65}$ $5\overline{)47}$

4. $7\overline{)61}$ $9\overline{)60}$ $7\overline{)62}$ $8\overline{)75}$ $6\overline{)57}$

5. $9\overline{)67}$ $8\overline{)68}$ $7\overline{)64}$ $5\overline{)46}$ $9\overline{)69}$

6. $7\overline{)69}$ $9\overline{)64}$ $5\overline{)38}$ $6\overline{)50}$ $8\overline{)67}$

7. $9\overline{)75}$ $8\overline{)76}$ $6\overline{)33}$ $8\overline{)79}$ $7\overline{)38}$

8. $7\overline{)60}$ $8\overline{)34}$ $9\overline{)83}$ $5\overline{)33}$ $5\overline{)29}$

Ask your teacher if you may play a game like the one on page 71, using this kind of examples.

9. How many weeks and how many days over are there in 54 days?

10. If you go to school 38 days, how many weeks and days do you go to school? (Remember that you go to school only 5 days a week.)

11. If you know how many inches tall you are, how do you find out how many feet and inches this is?

12. How many inches tall are you? How many feet and inches is this?

13. How many feet long is your schoolhouse? How many yards and feet is this?

14. Make other problems of this kind and solve them.

See page 347.

Example 1. Divide 684 by 2.

$$\begin{array}{r} 342 \text{ (quotient)} \\ \text{Divisor } 2\overline{)684} \text{ (dividend)} \end{array}$$

2 is contained in 6, 3 times. Write *3* directly above the 6. 2 is contained in 8, 4 times. Write *4* directly above the 8. 2 is contained in 4, 2 times. Write *2* above the 4.

Test the quotient by multiplying it by the divisor. The product should be the dividend.

> In division the number that is divided is called the **dividend**, and the number by which we divide is the **divisor**.

WRITTEN EXERCISES

Divide each of the following and test by multiplying:

1. $2\overline{)864}(432)$ $2\overline{)684}(342)$ $3\overline{)369}(123)$ $4\overline{)484}(121)$
2. $3\overline{)693}(231)$ $3\overline{)699}(233)$ $4\overline{)448}(112)$ $4\overline{)888}(222)$

Sometimes the first number of the dividend is so small that the divisor is not contained at all in it.

Example 2. Divide 1246 by 2.

$$\begin{array}{r} 623 \\ 2\overline{)1246} \end{array}$$

In this case we first divide 12 by 2, getting 6. Then go on as before.

Divide each of the following:

3. $\begin{array}{r} 934 \\ 2\overline{)1868} \end{array}$ $\begin{array}{r} 742 \\ 2\overline{)1484} \end{array}$ $\begin{array}{r} 512 \\ 3\overline{)1536} \end{array}$ $\begin{array}{r} 613 \\ 3\overline{)1839} \end{array}$
4. $\begin{array}{r} 421 \\ 4\overline{)1684} \end{array}$ $\begin{array}{r} 312 \\ 4\overline{)1248} \end{array}$ $\begin{array}{r} 812 \\ 3\overline{)2436} \end{array}$ $\begin{array}{r} 9243 \\ 2\overline{)18486} \end{array}$
5. $\begin{array}{r} 311 \\ 6\overline{)1866} \end{array}$ $\begin{array}{r} 733 \\ 3\overline{)2199} \end{array}$ $\begin{array}{r} 612 \\ 4\overline{)2448} \end{array}$ $\begin{array}{r} 4221 \\ 4\overline{)16884} \end{array}$
6. $\begin{array}{r} 211 \\ 5\overline{)1055} \end{array}$ $\begin{array}{r} 321 \\ 4\overline{)1284} \end{array}$ $\begin{array}{r} 423 \\ 3\overline{)1269} \end{array}$ $\begin{array}{r} 734 \\ 2\overline{)1468} \end{array}$
7. $\begin{array}{r} 523 \\ 3\overline{)1569} \end{array}$ $\begin{array}{r} 611 \\ 4\overline{)2444} \end{array}$ $\begin{array}{r} 821 \\ 4\overline{)3284} \end{array}$ $\begin{array}{r} 924 \\ 2\overline{)1848} \end{array}$

See page 347.

Example 1. Divide 476 by 2.

$$\begin{array}{r} 238 \\ 2\,\overline{)\,476} \end{array}$$

Test: $\boxed{\begin{array}{r} 238 \\ \underline{2} \\ 476 \end{array}}$

2 is contained in 4, 2 times. Write *2* directly above the 4. 2 is contained in 7 3 times with a remainder of 1. Write *3* directly above the 7. The remainder 1 placed to the left of the 6 makes 16. 2 is contained in 16 8 times.

To test, multiply the quotient by the divisor. The result should be the dividend.

Hundreds: 2 in 4, 2 times. Write *2*.
Tens: 2 in 7, 3 times, remainder 1. Write *3*.
Ones: 2 in 16, 8 times. Write *8*.

$\Big\}$ Short explanation

Example 2. Divide 785 by 5.

$$\begin{array}{r} 157 \\ 5\,\overline{)\,785} \end{array}$$

Test: $\begin{array}{|r|} 157 \\ \underline{5} \\ 785 \end{array}$

Hundreds: 5 in 7, 1 time, remainder 2. Write *1*.
Tens: 5 in 28, 5 times, remainder 3. Write *5*.
Ones: 5 in 35, 7 times. Write *7*.

To test, multiply 157 (the quotient) by 5 (the divisor). The result is 785 (the dividend).

In this way divide each of the following:

1.	**288** 2)576	**418** 2)836	**297** 3)891	**183** 3)549	**82** 3)246
2.	**224** 4)896	**192** 4)768	**164** 4)656	**199** 4)796	**214** 4)856
3.	**179** 5)895	**197** 5)985	**95** 5)475	**187** 5)935	**139** 5)695
4.	**131** 6)786	**141** 6)846	**160** 6)960	**142** 6)852	**124** 6)744

5. How many weeks are there in 609 days? **87**
6. How many yards are there in 549 feet? in 756 feet? **183; 252**

Ask your teacher if you may play the game like the one on page 91, using such examples as these. See page 347.

People learn to add, subtract, multiply and divide because they need to do these things in solving problems. The hardest part of arithmetic is to decide *when* to add, when to subtract, when to multiply, and when to divide.

First of all we must remember that the *sum* of numbers is found by adding them, the *difference* between numbers is found by subtracting, the *product* is found by multiplying, and the *quotient* is found by dividing. After you have made sure that you understand this, study the problems below with care.

ORAL AND WRITTEN EXERCISES

1. If you know how many children there are in your room and also in another room, how do you find how many children there are in both rooms? *Answer:* By adding the two numbers. Why?

Make problems of this kind and solve them.

2. If you know how much money you had when you went into a store, and also how much you had when you came out of it, how can you tell how much money you spent in that store? *Answer:* By subtracting what I had when I came out from what I had when I went in. Why?

Make problems of this kind and solve them.

3. If you know how much one chair costs, and also how many your mother bought, how can you tell how much she paid for them? *Answer:* By multiplying the cost of one chair by the number of chairs. Why?

Make problems of this kind and solve them.

4. If you know two numbers how can you tell how much larger one is than the other? *Answer:* By subtracting the smaller number from the larger. Why?

Make problems of this kind and solve them.

See page 347.

ORAL EXERCISES

1. If you know how many boys there are in a class and also how many girls, how can you tell how many there are all together in the class?

2. If you know how many children there are in a class and also how many boys there are, how can you tell how many girls there are in the class?

3. If you know how many children there are in each room of your school, how can you tell how many children there are in the school?

4. If you know how many children there are in your school, and also how many passed in number work, how can you tell how many failed in number work?

5. If you know how many desks were bought for your school and also how much each desk cost, how can you tell how much all the desks cost?

6. If you know two numbers, how do you find how much greater one is than the other?

7. If you know two numbers, how do you find the difference between them?

8. If you know the price of the arithmetics used in your class, and also the number of arithmetics needed, how can you tell how much these books cost?

9. If you know how many pages there are in a book, and also how many pages of it you have read, how can you tell how many pages you still have to read?

10. How do you find the sum of two numbers? Their difference? Their product?

11. Ask other questions like these, and answer them.

See page 348.

ORAL EXERCISES

1. Did you ever send a letter by mail? How much does it cost to send a letter by mail?

2. How much does a postal card cost?

3. Jane sent out 12 letters of invitation to a birthday party. How much did she pay for stamps?

4. While Jane was in the country for a visit, she sent 7 letters and 9 postal cards to her friends. How much did she spend for postage?

5. Jane's father keeps a store and sends out many letters each week. One day he bought 2-cent stamps for a dollar. How many did he get?

6. One day Jane's father walked up to the stamp window in the post-office and handing in a one-dollar bill said, "Give me 40 2-cent stamps and the rest in 1-cent stamps." How many 1-cent stamps did he get?

7. Did you ever see anyone get a letter by special delivery? How much extra does it cost to get a letter delivered this way?

8. How many special-delivery stamps can you buy for one dollar?

9. It costs 5 cents to send a letter to some foreign countries. How many 5-cent stamps can you buy for one dollar?

10. A sheet of stamps contains 100 stamps. What is the cost of a sheet of 2-cent stamps?

11. Make other problems on postage, and solve them.

See page 348.

1. William's baseball suit cost \$7.50, cap \$0.45, and belt \$0.35. What was the total cost of his outfit? **\$8.30**

2. What will be the total cost of 12 baseball outfits at \$8.25 each? **\$99.00**

3. A baseball team paid \$3.75 for a mask, \$5.50 for a body protector, \$2.50 for a catcher's glove, \$3.00 for balls, and \$2.50 for bats. How much did all these articles cost? **\$17.25**

4. William's baseball "nine" played 12 games and lost ⅓ of them. How many games did they lose? How many did they win? **4; 8**

5. Tom's baseball "nine" played 15 games and won ⅔ of them. How many games did they win? How many did they lose? **10; 5**

6. In a contest Harry batted a ball 215 feet, and John 183 feet. How much farther did Harry bat the ball than John? **32 ft.**

7. The distance around a baseball "diamond" is 360 feet. What is the distance from any of the four bases to the next one, if these four distances are all equal? **90 ft.**

8. On a regular baseball field the left-field fence is 380 feet from the home plate, and the right-field fence only 294 feet. How much farther must a batter hit a ball to go over the left- than over the right-field fence? **86 ft.**

9. Tom received \$3.25 a week for working in a store during vacation. How much did he earn in 7 weeks? **\$22.75**

10. Tom saved \$1.75 each week he worked. How much did he save in 7 weeks? **\$12.25**

See page 348.

1. In going camping some girls rode 108 miles on the train, 11 miles on trolley and 14 miles in an automobile. How far did they ride altogether? **133**

2. Each girl paid $2.16 railroad fare, $0.10 on the trolley, and $0.50 to ride in the automobile. How much fare did each girl pay altogether? **$2.76**

3. The total expense for each girl on this camping trip was $9.25. What did it cost 6 girls to make the trip? **$55.50**

4. Mary's mother bought her a camping suit for $12.35, a hat for $0.98 and a pair of shoes for $2.25. What was the total cost of Mary's outfit? **$15.58**

5. Jane helped Mrs. Smith mornings during vacation and saved $1.25 each week out of the money earned. How much did she save in 9 weeks? **$11.25**

6. Mary helped her mother by gathering eggs. One week she gathered 17 eggs on Sunday, 16 on Monday, 20 on Tuesday, 18 on Wednesday, 19 on Thursday, 20 on Friday, and 19 on Saturday. How many eggs did she gather this week? **129**

7. One week Mary gathered 165 eggs. The family used 43 of these eggs, and the rest were put down. How many eggs were put down? How do you find out? **122**

8. Nora went shopping and spent $1.35 in one store, $2.35 in a second, $2.65 in a third, and $0.85 in a fourth. How much did her purchases amount to altogether? **$7.20**

9. Elizabeth sold 16 Chautauqua tickets for $2.25 each. How much did she receive for the 16 tickets? **$36.00**

10. Elizabeth was paid 1/6 of the $36 she received for the tickets. How much did she earn selling tickets? **$6.00**

See page 349.

If you have done this year's work in arithmetic well, you will be able to answer these questions rapidly and accurately.

1. Add: $\begin{array}{r}14894\\ 39877\\ \hline 54771\end{array}$ Subtract: $\begin{array}{r}90742\\ 49378\\ \hline 41364\end{array}$ Explain these processes.

Supply the missing numbers in the following and give all number facts related to each one.

2. $4\times 8=?$ $7\times 6=?$ $9\times 5=?$ $6\times 9=?$ $8\times 3=?$
3. $5\times 8=?$ $7\times 8=?$ $9\times 7=?$ $9\times 9=?$ $8\times 9=?$
4. $6\times 6=?$ $8\times 6=?$ $7\times 7=?$ $4\times 9=?$ $8\times 8=?$

Give quotients and remainders in the following:

5. $8\overline{)46}$ $7\overline{)58}$ $6\overline{)39}$ $8\overline{)68}$ $9\overline{)43}$ $7\overline{)61}$
6. $5\overline{)32}$ $9\overline{)76}$ $8\overline{)59}$ $7\overline{)47}$ $6\overline{)49}$ $9\overline{)34}$
7. $7\overline{)53}$ $6\overline{)38}$ $5\overline{)47}$ $8\overline{)43}$ $8\overline{)37}$ $8\overline{)79}$
8. $3\overline{)20}$ $3\overline{)26}$ $3\overline{)28}$ $3\overline{)19}$ $4\overline{)27}$ $6\overline{)47}$
9. $8\overline{)52}$ $8\overline{)69}$ $8\overline{)74}$ $8\overline{)41}$ $8\overline{)38}$ $8\overline{)29}$

Supply the missing numbers:

10. 1 lb. = ? oz.
1 pk. = ? qt.
1 bu. = ? pk.
1 bu. = ? qt.
1 gal. = ? qt.
1 qt. = ? pt.
1 day = ? hours
1 ft. = ? in.
1 yd. = ? in.
1 yd. = ? ft.
1 sq. yd. = ? sq. ft.

1 week = ? days
1 year = ? months
1 year = ? days
1 nickel = ? cents
1 dime = ? cents
1 quarter = ? cents
1 dollar = ? cents
1 quarter = ? nickels
1 dollar = ? dimes
1 dollar = ? nickels
1 dollar = ? quarters

See page 349.

You should now be able to copy and solve the following rapidly and accurately.

I

Add:

1. 467	2. 576	3. 687	4. 784
836	487	468	675
593	635	597	486
748	796	768	519
675	568	492	673
3319	3062	3012	3137

Subtract:

5. 4679	6. 5798	7. 6700	8. 7305
3789	3899	4998	6089
890	1899	1702	1216

Multiply:

9. 430	10. 762	11. 575	12. 290
526	630	837	967
226180	480060	481275	280430

II

Add:

1. 6324	2. 8632	3. 9026	4. 4068
1978	5916	5784	4507
3867	7985	9843	4984
7698	4896	7987	3763
9678	9874	8796	4327
29545	37303	41436	21649

Subtract:

5. 39082	6. 1937	7. 45103	8. 15501
21874	862	12792	3272
17208	1075	32311	12229

Multiply:

9. 204	10. 142	11. 246	12. 798
720	143	123	284
146880	20306	30258	226632

See page 349.

CHAPTER IV

READING NUMBERS

ORAL EXERCISES

1. Count to 1000 by hundreds. How many hundreds are there in 1000?

2. The number 10,000 is read *ten thousand.* Count to 10,000 by thousands.

3. The number 100,000 is read *one hundred thousand.* Count to 100,000 by ten thousands.

If a number has more than four figures it is usual to separate them into groups of three in each, beginning from the right. These groups are called *periods.* The first period to the right represents *ones*, the second *thousands*, the third *millions.* Thus in the number 4,659,321, the period to the right represents 321 *ones*, the next period represents 659 *thousands*, and the next period represents 4 *millions.*

WRITTEN EXERCISES

Copy and separate into periods the following numbers, which the United States Census of 1910 gave as the populations of the States and cities named:

States		Cities	
New York	9113614	New York	4766883
Pennsylvania	7665111	Chicago	2165233
Illinois	5638581	Philadelphia	1542008
Ohio	4767121	St. Louis	687029
Texas	3896542	Boston	670585

See page 349.

The number 2,790,408 is read *two million, seven hundred ninety thousand, four hundred eight.*

ORAL EXERCISES

Read each of the following numbers:

2760
3436
47,082
50,793
157,483
238,936
1,435,678
3,502,891

WRITTEN EXERCISES

Write the following numbers in figures:

1. One hundred twelve thousand, five hundred eleven.
2. Two hundred thirty-seven thousand, six hundred twenty.
3. Forty-eight thousand, two hundred ten.
4. Six million, ninety-five thousand, six hundred eighty-four.
5. Seven hundred three thousand, thirty-four.
6. Five million, eight hundred thousand, six hundred twenty-three.
7. Three million, two hundred thirty thousand, seven hundred forty-five.
8. Eight million, fifteen thousand, one hundred sixty-seven.
9. Nine million, four thousand, six hundred ninety-five.
10. Six million, three hundred forty thousand, four hundred twenty-nine.
11. Seven million, nine hundred eighty-six thousand, four hundred twenty-nine.
12. Collect some large automobile numbers and house numbers, or other large numbers, and read them. See which member of the class can find the largest ones.

See page 350.

The figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 are called *Arabic* figures or Arabic numerals because the Arabs introduced them into Europe.

The *Romans* wrote all their numbers by means of combinations of the following letters, whose values are given directly below the letters:

Letters:	I	V	X	L	C	D	M
Values:	1	5	10	50	100	500	1000

You have learned from the face of the clock the first twelve Roman numerals, which are:

I II III IV (or IIII) V VI VII VIII IX X XI XII

In the Roman notations these letters are combined according to the following rules:

When a letter of less value stands to the left of another letter then its value is subtracted.

In all other cases the numbers are added.

Thus in IV and in XIX the number I is subtracted, while in VI and in XXI it is added. That is, $\text{IV} = 5 - 1 = 4$, $\text{XIX} = 10 - 1 + 10 = 19$, $\text{VI} = 5 + 1 = 6$, $\text{XXI} = 10 + 10 + 1 = 21$.

ORAL EXERCISES

Read the following numbers:

XIII	(13)	XXVI	(26)	LXVII	(67)	CC	(200)	CD	(400)
XV	(15)	XXXIV	(34)	LXXX	(80)	MDC	(1600)	CM	(900)
XVIII	(18)	XLI	(41)	LXXIX	(79)	DC	(600)	MC	(1100)
XX	(20)	LII	(52)	XC	(90)	DCC	(700)	MCC	(1200)

WRITTEN EXERCISES

Write the following numbers in the Roman notation: 15, 20, 30, 50, 60, 90, 100, 120, 190, 350, 550.

See page 350.

ORAL EXERCISES

See how long it takes you to add the first twenty examples below and write the sums. How long does it take you to add the last twenty and write the sums? Add each column both downward and upward. Do not copy the numbers. Place a paper directly below the columns and write the sums on it.

In adding the first column downward, say 5, 8, 10, 12, 17. Do *not* say 5+3=8, 8+2=10, and so on.

1.	5	2	2	6	9	2	7	8	6	3
	3	9	5	4	6	2	3	4	7	6
	2	5	8	3	0	2	5	5	5	3
	2	0	4	8	7	4	5	5	8	4
	5	3	1	9	7	5	2	3	5	1
	17	19	20	30	29	15	22	25	31	17
2.	6	8	9	3	9	7	7	3	2	7
	2	5	6	1	4	6	7	8	4	4
	2	1	0	5	5	4	9	3	7	9
	8	3	4	8	2	1	0	1	2	4
	6	8	9	1	3	9	9	3	5	4
	24	25	28	18	23	27	32	18	20	28
3.	4	2	5	4	7	5	4	4	7	7
	2	6	3	7	7	0	4	0	3	2
	9	0	8	8	1	4	3	8	3	2
	8	5	0	3	7	3	8	9	6	4
	6	6	6	2	5	6	6	7	6	3
	29	19	22	24	27	18	25	28	25	18
4.	7	2	5	8	0	3	9	6	5	6
	8	4	4	8	9	0	7	3	3	8
	6	7	7	5	8	6	0	4	4	3
	0	6	1	8	0	0	5	3	6	8
	5	4	9	4	6	9	4	5	8	7
	26	23	26	33	23	18	25	21	26	32

See page 351.

Example. Add the numbers 38,764, 21,926, 70,437, 8246, and 285.

First write the numbers in a column as shown below.

In copying the numbers, be careful to place all the *ones* in the first column, all the *tens* in the second column, and so on.

EXPLANATIONS

$$\begin{array}{r}38764\\21926\\70437\\8246\\285\\\hline 139658\\{\scriptstyle 1\,2\,2\,2}\end{array}$$

Ones: 4, 10, 17, 23, 28. Write *8*, carry 2.
Tens: 2, 8, 10, 13, 17, 25. Write *5*, carry 2.
Hundreds: 2, 9, 18, 22, 24, 26. Write *6*, carry 2.
Thousands: 2, 10, 11, 19. Write *9*, carry 1.
Hundred thousands: 1, 4, 6, 13. Write *13*.

Frequently the numbers to be carried are written in small pencil figures below the numbers in the sum, as shown here.

Test the result by adding each column upward as well as downward. Read the sum.

WRITTEN EXERCISES

Write the numbers below in columns and add them. Test by adding each column both downward and upward. Read each sum. Explain fully the first two examples.

1. 2819, 79586, 587, 68597, 4251, 847693, 324781. 1,328,314
2. 840, 6890, 2806, 10846, 4176, 294624. 320,182
3. 5081, 419, 7629, 38672, 84871, 7617, 93408. 237,697
4. 3412, 799, 471, 93840, 9130, 4578, 19370. 131,600
5. 8510, 297, 1704, 304839, 20139, 84323, 30917. 450,729
6. 1805, 1942, 2976, 17488, 1777, 3408. 29,396
7. 2170, 3471, 95400, 32742, 54321, 5243, 92642. 285,989

Drill in Fundamentals. Play a game like the one on page 91, using examples in addition.

See page 351.

This girl receives the cash paid in by customers of the store. She writes in columns the amounts she receives. At the end of the day she adds these amounts to see how much has been received during the day. Then she counts the money to see whether she has made change correctly. She adds each column separately, and then adds the sums.

WRITTEN EXERCISES

Find the sum of each column, then add the sums: **$203.15**

$1.76	$0.41	$7.12	$0.83
4.91	.92	12.84	.49
4.62	.38	9.36	7.89
.84	.46	.41	6.48
.35	3.61	.04	.10
.18	4.91	2.18	.94
6.07	7.38	.34	.07
$18.73	**$18.07**	**$32.29**	**$16.80**
$0.41	$5.93	$0.46	$0.38
10.83	8.64	.71	2.40
1.12	1.91	2.18	.32
16.94	3.17	8.73	.08
5.75	10.40	5.30	2.10
8.70	2.60	6.70	1.70
1.60	2.70	1.90	3.60
$45.35	**$35.35**	**$25.98**	**$10.58**

In all larger stores the cash received is now added on the cash register. But in the home, on the farm, in many small stores, shops, and other businesses, items of cash are added as shown on this page.

See page 351.

Marshall, Field & Co.,
Chicago, Ill.
Purchases for month ending Dec. 31, 1918.
Mr. James B. Noble,
5835 Prairie Ave.

			Charges		Total	
Dec.	8	One suit................	$27	50		
		6 shirts at $1.50.........	9	00		
		1 dozen collars..........	1	75		
		3 ties at 75¢...........	2	25		
		Total..............			$40	50

Copy this bill and add to find the total amount. Marshall, Field & Co. are the sellers, and James B. Noble is the buyer.

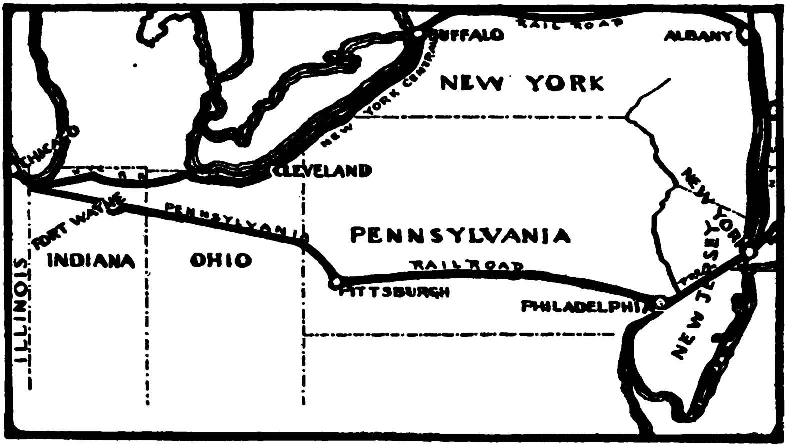
WRITTEN EXERCISES

Make out a bill from each of the following. Use your own name as that of the buyer and the name of some store that you know as the seller.

1 tablecloth.................	$3.75
1 dozen napkins.............	2.50
6 bath towels................	1.90
6 muslin sheets at 55¢ apiece.	3.30
8 pillow-cases at 17¢ apiece..	1.36
Total..................	$12.81

1 brass bed.........	$11.75
6 chairs at $2.75 apiece......	16.50
1 mattress..................	12.95
1 swing chair..............	1.25
1 parlor chair...............	7.50
Total..................	$49.95

See page 351.



WRITTEN EXERCISES

1. By way of the Pennsylvania Railroad the distance from New York to Philadelphia is 90 miles, Philadelphia to Pittsburgh 354 miles, Pittsburgh to Fort Wayne 320 miles, Fort Wayne to Chicago 148 miles. How many miles is it from New York to Chicago? 912

2. On the New York Central the distance from New York to Albany is 143 miles, from Albany to Buffalo 297 miles, Buffalo to Cleveland 183 miles, Cleveland to Chicago 357 miles. How many miles is it from New York to Chicago by way of the New York Central? 980

3. The distance from Boston to Chicago is 1037 miles, Chicago to St. Paul 412 miles, St. Paul to Seattle 1913 miles. What is the distance from Boston to Seattle? 3362

4. From Chicago to Omaha is 492 miles, Omaha to Salt Lake City 1037 miles, Salt Lake City to San Francisco 749 miles. Find the total distance. 2278

See page 352.

WRITTEN EXERCISES

1. A school of 8 rooms has the following enrollment for the various rooms: 41, 36, 38, 43, 35, 43, 44 and 45 pupils. How many pupils are enrolled in the school? **325**

2. One day the attendance in these rooms was 40, 36, 36 41, 34, 42, 41 and 43. What was the total attendance this day? **313**

3. In a large grade-school building there are 217 children in the first grade, 194 in the second grade, 180 in the third grade, 165 in the fourth grade, 152 in the fifth grade, 150 in the sixth grade, 104 in the seventh grade, and 89 in the eighth grade. How many children are there in the whole building? **1251**

4. In a certain city there are thirteen school buildings. The numbers of pupils in these buildings are: 397, 264, 542, 631, 606, 428, 467, 792, 420, 685, 361, 298 and 427. How many pupils are there in the schools of this city? **6318**

5. The numbers of teachers in these buildings are: 13, 10, 17, 22, 16, 13, 15, 25, 14, 22, 11, 9 and 14. How many teachers are there in these schools? **201**

6. In finding the number of children of school age in a large city, the number in each district is counted. Then how may the total number be found? Explain why it would be difficult to count all the children in the city directly without adding.

7. How do you think the number of children in the schools of a large city is found? Try to find the number of children in some large schools. Then find the number of children in all of them.

See page 352.

Example. From 3904 subtract 1247.

First Method:

3904 (minuend)	*Ones:* 14 = 7 + 7. Write *7*, carry 1.
1247 (subtrahend)	*Tens:* 10 = 5 + 5. Write *5*, carry 1.
2657 (remainder)	*Hundreds:* 9 = 3 + 6. Write *6*.
	Thousands: 3 = 1 + 2. Write *2*.

In practice we simply say:

14 = 7 + 7; 10 = 5 + 5; 9 = 3 + 6; 3 = 1 + 2.

Second Method:

We cannot take 7 from 4, so we take 1 hundred from 9 hundreds and think of it as 90 + 10. The 10 is added to the 4, making 14, and the 90 is put in tens' place. Then 7 from 14 leaves 7, 4 tens from 9 tens leaves 5 tens, 2 hundreds from 8 hundreds leaves 6 hundreds, 1 thousand from 2 thousands leaves 1 thousand.

In practice we say: 14 − 7 = 7, 9 − 4 = 5, 8 − 2 = 6, 3 − 1 = 2.

WRITTEN EXERCISES

Subtract each of the following:

1. 4094 1427 2667	2. 1794 379 1415	3. 5004 897 4107	4. 2743 850 1893
5. 8107 489 7618	6. 1109 478 631	7. 5407 2806 2601	8. 8109 3824 4285
9. 14004 8647 5357	10. 21094 7808 13286	11. 85000 6478 78522	12. 60000 45782 14218
13. 5061 3708 1353	14. 8160 2497 5663	15. 6470 2972 3498	16. 28754 16907 11847
17. 23420 16090 7330	18. 79420 16800 62620	19. 22720 9847 12873	20. 78900 24763 54137

See page 352.

WRITTEN EXERCISES

1. The highest mountain in the world is 29,002 feet high. The highest mountain in the United States is 20,464 feet high. What is the difference between these heights? **8538**

During four recent years the losses from fire in the United States and the insurance on these losses were as follows:

Fire Losses	Insurance	
$214,003,300	$150,246,000	**$63,757,300**
217,004,575	161,200,000	**55,804,575**
225,320,000	176,359,200	**48,960,800**
229,000,000	180,000,000	**49,000,000**

2. Find the difference between the losses and insurance for each year separately, and also for the four years. **$217,522,675**

Stores have prices marked on the articles they sell. Sometimes the goods are sold below the marking price. The amount by which the price is lowered is called *discount*.

3. A lady bought the following pieces of furniture:

	Marked Price	Discount	
1 table...............	$46.50	$4.65	**$41.85**
1 bed................	54.00	5.40	**48.60**
1 dozen chairs........	72.00	7.20	**64.80**
1 rug.................	45.00	4.50	**40.50**
1 sideboard...........	84.00	8.40	**75.60**

Tell the marking price of each article and the discount. What was the selling price of each article?

4. How much did the lady save all together by getting these discounts? **$30.15**

5. Find advertisements of sales in your paper and make problems like the above.

See page 352.

Read pages 147, 151 and 161 again, and supply the missing numbers. You should be able to read these pages rapidly. Make a list of those combinations that you cannot give at once and then practice on them.

ORAL EXERCISES

Read the following and supply the missing numbers:

1. 8×6=?
?×9=36
9×9=?
7×?=35
5×?=30
9×?=72
?×?=81
8×?=72
7×?=56
?×7=49
8×8=?
8×?=32
6×?=36
8×?=56
?×?=49
9×?=81
9×?=63
?×8=48
7×7=?
9×?=45
7×?=49
7×?=63
?×?=64
9×?=63
5×?=45
?×7=56
6×6=?
6×?=54
8×?=64
9×?=54
?×?=36
7×?=56

ORAL AND WRITTEN EXERCISES

Answer as many as you can of the following without using pencil and paper:

2. Multiply each of the numbers 3, 6, 7, 8, 4, 5, by 10.
   Notice that to multiply a number by 10 we annex one zero to the right.

To multiply a number by 20, multiply it by 2 and then by 10, that is, multiply it by 2 and annex one zero.

3. Multiply each of the following by 20: 18, 21, 46, 34, 52, 61, 73, 68, 57.

4. How may a number be multiplied by 30? By 40? By 50? By 60? By 70? By 80? By 90?

5. Find the products of the following: 60×38, 70×48, 80×59, 90×27, 50×89, 60×86, 70×65, 80×98, 90×68.

2280, 3360, 4720, 2430, 4450, 5160, 4550, 7840, 6120
page 353.

A FIELD MEET

The teacher has selected 4 captains, who have chosen their teams. The teacher reads number combinations, such as ?×8=56. The pupils write these and supply the missing numbers.

After the children have finished writing they exchange papers and mark the answers that are wrong or missing as the teacher reads the correct results. Then they count the number of correct answers and write this number on the paper. No child marks a paper belonging to a child on his own team. The papers are returned to the owners, and each child looks over his own paper to make sure it has been marked correctly. As each child reads his score the others write it in the column of his team. The scores are added, and the team that gets the highest score wins. If a child makes a mistake in marking a paper or in adding the score, one point is deducted from the score of his team for each mistake.

The children play they are having a field meet. The game just played is the first event. The next day they play the same game with combinations like $\frac{1}{7}$ of 42=? This is the second event. The third day they play the same game with combinations like 54÷6=? This is the third event.

The same teams play in all the events. The scores for all events are added, and the team that gets the highest total score wins.

See page 353.

1. The Royal Hand Laundry.

Look over this laundry bill with care to see whether it is made out correctly or not.

Name Norman Parker.

Pcs			Amt.
5	collars............	2¢	10
2	shirts with cuffs....	12¢	24
2	undershirts.........	8¢	16
2	drawers...........	8¢	16
4	handkerchiefs......	1¢	4
3	socks, per pair.....	4¢	12
	Total..........		**$.82**

If you pay this bill with a dollar what is your change? **$.18**

Make out the following laundry bills, putting the name of your laundry and your own name on each:

2.	3	aprons.....	8¢	**24**
	4	tablecloths.	8¢	**32**
	10	napkins....	2¢	**20**
	16	towels.....	2¢	**32**
	8	sheets......	5¢	**40**
	8	pillow-cases	4¢	**32**
		Total.......		**$1.80**

3.	3	boys' waists..	12¢	**36**
	1	dress.........	50¢	**50**
	2	wrappers.....	20¢	**40**
	1	spread........	15¢	**15**
	2	ladies' waists..	25¢	**50**
	4	towels........	2¢	**8**
		Total..........		**$1.99**

4.	6	collars.......	2¢	**12**
	2	cuffs, per pair	4¢	**8**
	3	shirts........	12¢	**36**
	2	night-shirts...	10¢	**20**
	6	socks, per pair	4¢	**24**
	3	union suits...	15¢	**45**
		Total.......		**$1.45**

5.	14	handkerchiefs.	2¢	**28**
	5	stockings, pair	5¢	**25**
	2	wrappers.....	20¢	**40**
	8	underwear....	8¢	**64**
	4	collars........	4¢	**16**
	1	waist.........	25¢	**25**
		Total..........		**$1.98**

If you pay each of these bills with two dollars, what is your change in each case? **20c; 1c; 55c; 2c**

See page 353.

Example 1. Multiply 846 by 234.

846
234
3384
2538
1692
197964

Multiply by 4 ones; 4×846=3384. Multiply by 3 (tens), placing the first figure in tens' column; 3 (tens) × 846=2538 (tens). Multiply by 2 (hundreds), placing the first figure in hundreds' column; 2 (hundreds) × 846=1692 (hundreds).

Example 2. Multiply 3182 by 804.

3182
804
12728
25456
2558328

First multiply by 4; then by 8 (hundreds). Place the first figure of the second product in hundreds' column.

WRITTEN EXERCISES

Multiply:

1. 784 327 256368	2. 896 473 423808	3. 674 584 393616	4. 895 697 623815
5. 975 789 769275	6. 876 895 784020	7. 896 987 884352	8. 659 498 328182
9. 904 307 277528	10. 784 806 631904	11. 293 407 119251	12. 809 507 410163
13. 807 609 491463	14. 804 703 565212	15. 907 605 548735	16. 306 409 125154
17. 408 723 294984	18. 809 847 685223	19. 406 804 326424	20. 508 603 306324

Drill in Fundamentals. Play the game on page 91, using examples in multiplication.

See page 353.

These children are playing dry-goods store. Two children are clerks. They make out sales checks like the one on the next page.

ORAL AND WRITTEN EXERCISES

1. How does the clerk find out how much the 8 yards of silk cost? Find this cost. **$6.80**

2. How does he find out how much the 12 yards of serge cost? Find this cost. **$9.12**

3. How does he find out how much the 18 yards of sheeting cost? Are the amounts given in the bill on the next page correct? **$3.42**

4. How much does the whole bill amount to? **$19.34**

5. What change should be given from a $20.00 bill? **$.66**

6. At the prices given above find the cost of 26 yards of silk and 54 yards of sheeting. How much do both cost? **$32.36**

7. At the above prices find the total cost of 14 yards of silk, 18 yards of serge, and 36 yards of sheeting. **$32.42**

See page 354.

John Wanamaker
General Merchandise
New York, N. Y. March 9, 1915

8	yards of silk at 85¢....................	$6.80
12	yards of serge at 76¢....................	9.12
18	yards of sheeting 19¢....................	3.42
	Amount received, $20.00...............	$19.34

WRITTEN EXERCISES

Make out sales checks for the following sales and put in the name of some store as the seller. First find how much each sale amounts to, then find how much change is given in each case.

1.	6 pairs of socks at 25¢ a pair..............	$1.50
	3 shirts at $1.25...........................	3.75
	1 dozen collars.............................	1.30
	Amount received, $10.00..............	$6.55
	Change	3.45
2.	1 boy's suit................................	$2.25
	1 boy's sweater.............................	1.80
	1 boy's hat.................................	2.25
	3 ties at 35¢...............................	1.05
	Amount received, $10.00..............	$7.35
	Change	2.65
3.	1 toy bank..................................	$0.50
	2 children's books at 35¢...................	70
	3 games at 63¢..............................	1.89
	1 toy engine................................	1.75
	Amount received, $5.00...............	$4.84
	Change	16c
4.	6 sheets at 85¢.............................	$5.10
	8 pillow-cases at 25¢.......................	2.00
	1 dozen towels at 35¢ apiece................	4.20
	Amount received, $15.00..............	$11.30
	Change	3.70

See page 354.

ORAL AND WRITTEN EXERCISES

1. Name the months of the year. See page 166.

2. How many days are there in each month? in the first six months? **181 days.**

3. How many days are there in an ordinary year? in a leap-year?

4. How many years old were you on your last birthday? How many days old were you, counting 365 days to the year?

5. How many years ago were you born? Find out for yourself what year that was.

6. How many days old will you be on your next birthday?

7. How many years old was your father on his last birthday? How many days old was he then, counting 365 days to the year?

8. How many days do you go to school each week? How many weeks of school do you have each year? How many school days is that?

There are 365 days in one year
There are 52 weeks in one year

9. A man goes to his business 280 days in one year. How much car-fare does he pay in one year going to and from his business, if he pays a nickel each way? **$28.00**

10. Write five interesting facts about the calendar. Read them aloud to see which child has found the most interesting ones.

11. What months have 31 days? What months have 30 days? What month has 28 days?

See page 354.

ORAL AND WRITTEN EXERCISES

(Use pencil and paper only when necessary)

1. If you save one cent each day, how much will you save in one year? **$3.65**
2. Harry puts two cents into his bank every school day. How much does he save in one week? in 6 weeks? **10c; 60c**
3. James puts a dime into his bank every week. How much will he have at the end of his school year (38 weeks)? **$3.80**
4. Herbert's father puts $25 into the bank each year for his son. How much will he put in for him in 21 years? **$525.00**
5. During the 10 weeks before Christmas, Mary saved 2 cents every day. How much did she save? What Christmas presents could she buy with this money? **$1.40**
6. Some children live about a mile from school. How much does each child save in a week by walking instead of riding if the fare is 5 cents each way? **50c**
7. Alice puts 3 cents into the school savings bank each school day. How much does she save in one week? In 7 weeks? **15c; $1.05**
8. Steven puts 2 cents into the Penny Provident Savings Bank every day of the week except Sunday. How much does he save in one week? in 10 weeks? in a school year of 38 weeks? **12c; $1.20; $4.56**
9. Make problems about putting a certain amount of money in the school savings bank each day.

Drill in Fundamentals. Play a game like that on page 195, using examples in addition for the first event, examples in subtraction for the second event, and examples in multiplication for the third. Run off one event each day.

See page 354.

Apples, 3 for 5¢
Oranges, 3 for 10¢
Bananas, 2¢ apiece
Grapefruits, 15¢ apiece

Lemons, 30¢ a dozen
Peaches, 40¢ a basket
Grapes, 18¢ for a small basket
30¢ for a large basket

WRITTEN EXERCISES

At the above prices, what would be the cost of each of the following purchases? Make out sales check like those on page 199 for each purchase. Find the cost of each article without using pencil and paper.

1. 6 apples
3 oranges
1 small basket of grapes
38¢

2. ½ dozen apples
1 basket of peaches
½ dozen lemons 65¢

3. 1 dozen bananas
½ dozen oranges
3 grapefruits 89¢

4. 1 dozen oranges
½ dozen bananas
1 large basket of grapes
82¢

5. ½ dozen lemons
4 grapefruits
1 dozen oranges $1.15

6. 1 basket of peaches
1 dozen apples
1½ dozen bananas
96¢

7. 2 grapefruits
1 dozen bananas
½ dozen oranges 74¢

8. 1 large basket of grapes
4 grapefruits
6 oranges $1.10

9. 1 small basket of grapes
9 apples
15 oranges 83¢

10. 1 basket peaches
½ dozen oranges
½ dozen apples 70¢

11. Make examples about what you would buy at this fruit store. Tell what coins you would use to pay with and what change you would get. See who can make the most interesting examples.

See page 354.

Chicken 24¢	Round steak 20¢
Porterhouse 28¢	Boiled ham 40¢
Frankfurters 16¢	Lamb chops 26¢

ORAL AND WRITTEN EXERCISES

1. What is the cost of a chicken weighing 3½ pounds?

The cost of 3 pounds is 3×24¢, or 72¢. The cost of half a pound is ½ of 24¢, or 12¢. The cost of 3½ pounds is 72¢ + 12¢, or 84¢.

Find the cost of each of the following purchases.

2. 1½ pounds of porterhouse
½ pound of frankfurters **$.50**

3. A chicken weighing 4¾ pounds
½ pound of cold boiled ham **$1.34**

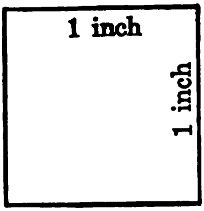
4. 1¾ pounds of round steak **$.35**

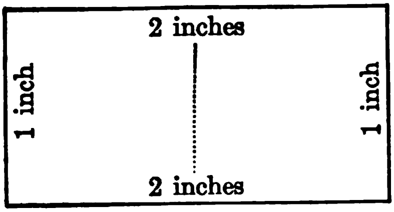
5. 2 pounds of lamb chops
¼ pound of boiled ham **$.62**

6. 1¼ pounds of porterhouse
1¾ pounds of round steak **$.70**

7. Make out sales checks for some of the above purchases.

See page 354.





ORAL AND WRITTEN EXERCISES

How long and how wide is each of the above figures?

1. If the figure to the left represents 1 square foot, what does the figure to the right represent?

2. Draw a figure 3 inches wide by 6 inches long. If 1 inch represents 2 feet, what lengths are represented by the sides of this figure?

3. The top of a certain table is 3 feet wide and 5 feet long. Make a drawing of it, letting 1 inch represent 1 foot. How long will the drawing be?

> If 1 inch represents 1 foot, we say the *scale* of drawing is "1 inch to 1 foot." If 1 inch represents 8 feet the scale is "1 inch to 8 feet."

4. Draw a figure 2½ inches wide by 4½ inches long. If this is a drawing of a table to the scale 1 inch to 1 foot, what are the dimensions of the table?

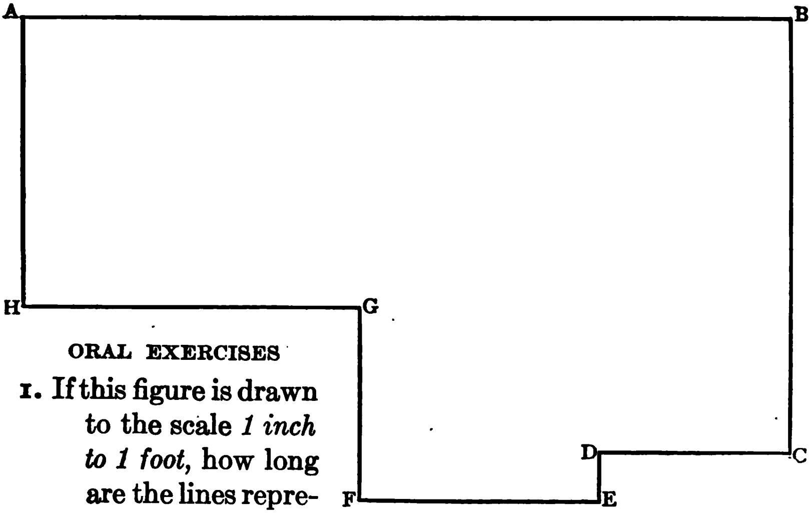
5. Make a drawing to the scale *1 inch to 1 foot* representing a door 2½ feet wide and 6½ feet high.

6. Make a drawing to the scale *1 inch to 1 foot* representing a window 3½ feet wide and 5 feet high.

Drill in Fundamentals. Play a game like that on page 91, using examples in subtraction.

See page 355.

On maps you will usually find a scale given. This is true also of drawings representing buildings, streets, and a great many other things.



ORAL EXERCISES

1. If this figure is drawn to the scale *1 inch to 1 foot*, how long are the lines represented by AB, BC, CD, DE, EF, FG, GH, HA?

2. If this figure is drawn to the scale *1 inch to 12 feet* how long are the lines represented by AB, BC, CD, DE, EF, FG, GH, HA?

3. If this figure is drawn to the scale *1 inch to 16 feet* how long are the lines represented by AB, BC, CD, DE, EF, FG, GH, HA?

WRITTEN EXERCISES

1. Draw a rectangle representing your schoolroom, to the scale *1 inch to 6 feet*. Make it as nearly accurate as you can.

2. The teacher will help you to make a drawing to scale representing your school program.

See page 355.

WRITTEN EXERCISES

Copy the following and see how long it takes you to a them:

1. 79472	2. 34125	3. 210	4. 29782
8641	6789	63	9647
91040	2014	826	23480
352	305	267	1940
476	6543	9432	7123
8420	821	491	621
188401	50597	11289	72593

Copy the following and subtract:

5. 97470	6. 9104	7. 8034	8. 34125
8596	3052	6479	17908
88874	6052	1555	16217
9. 21046	10. 29782	11. 2348	12. 7123
9437	9747	1940	697
11609	20035	408	6426
13. 31502	14. 27040	15. 19400	16. 40190
16481	25287	2746	24632
15021	1753	16654	15558

Copy the following and multiply:

17. 491	18. 2120	19. 7654	20. 20910
617	679	408	978
302947	1439480	3122832	20449980
21. 2840	22. 3292	23. 4789	24. 8463
760	274	965	204
2158400	902008	4621385	1726452

Drill in Fundamentals. Play the game on page 195, using examples like 7×8=? for the first event, examples like $\frac{1}{7}$ of 63=? for the second event, and examples like 56÷8=? for the third event. Run off one event each day.

See page 355.

WRITTEN EXERCISES

1. In a large orchard there are 56 rows of apple trees with 36 trees in each row. How many apple trees are there in this orchard? **2016**

2. How many bushels of apples are picked from an orchard containing 1850 apple trees if they yield 3 bushels per tree? **5550**

3. At 85 cents per bushel what is the selling price of 4640 bushels of apples? **$3944**

4. How many square yards are there in a sidewalk 2 yards wide by 160 yards long? **320**

5. At $1.30 a square yard, find the cost of laying 320 square yards of concrete sidewalk. **$416**

6. A man figures that it costs on an average 7 cents a mile to run a small automobile. How much does it cost him to run it 7846 miles? **$549.22**

7. At 12 cents a mile for all expenses, what is the cost of running a heavy touring car 9840 miles? **$1180.80**

8. At $4.25 a day how much will a man earn in 312 days? **$1326**

9. A hotel bought 56 pounds of butter at 32 cents a pound, 36 dozen eggs at 27 cents a dozen, 148 pounds of turkey at 23 cents, and 274 pounds of beef at 17 cents. How much did each of these items cost? How much did these things all cost?
$17.92; $9.72; $34.04; $46.58. Total $108.26

10. A boy buys newspapers at the rate of $1.40 a hundred and sells them at 2 cents apiece. One week he sold 600 papers. How much did they cost him? For how much did he sell them? **$8.40; $12.00**

See page 355.

ORAL AND WRITTEN EXERCISES

1. Draw a line on the board and divide it into 4 equal parts. What fraction of the line is each part? How do you write this fraction?
2. How many 4ths are there in 1?
3. Draw a line and divide it into 5 equal parts. What fraction of the line is each part? How do you write this fraction?
4. How many 5ths are there in 1? in 2? in 3?
5. Divide a line into fifths and show $\frac{3}{5}$, $\frac{4}{5}$, $\frac{2}{5}$.

One or more of the equal parts of a thing is called a *fraction* of the thing. One or more of the equal parts of a number is called a fraction of the number.

The *denominator* of a fraction, written below the line, tells into how many parts a thing or number has been divided, and the *numerator*, written above the line, tells how many of these parts are taken.

6. Draw lines and divide them to show the meaning of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{8}$, $\frac{4}{5}$, $\frac{1}{6}$, $\frac{2}{6}$, $\frac{3}{8}$, $\frac{4}{6}$, $\frac{5}{6}$.
7. Draw a line 12 inches long. On it show $\frac{1}{2}$ of 12, $\frac{1}{3}$ of 12, $\frac{1}{4}$ of 12.
8. On the same line show $\frac{2}{3}$ of 12, $\frac{3}{4}$ of 12, $\frac{1}{6}$ of 12, $\frac{5}{6}$ of 12.
9. How many inches are there in one foot? in $\frac{1}{2}$ of a foot? in $\frac{1}{3}$ of a foot? in $\frac{2}{3}$ of a foot? in $\frac{1}{4}$ of a foot? in $\frac{3}{4}$ of a foot?

See page 355.

ORAL EXERCISES

Read the following and supply the missing numbers:

1. $\frac{1}{4}$ of $8 = ?$
$\frac{3}{4}$ of $8 = ?$
$\frac{1}{5}$ of $10 = ?$
$\frac{2}{5}$ of $10 = ?$
$\frac{3}{5}$ of $10 = ?$

2. $\frac{4}{5}$ of $10 = ?$
$\frac{1}{3}$ of $12 = ?$
$\frac{2}{3}$ of $12 = ?$
$\frac{1}{4}$ of $12 = ?$
$\frac{3}{4}$ of $12 = ?$

3. $\frac{1}{2}$ of $14 = ?$
$\frac{1}{7}$ of $14 = ?$
$\frac{2}{7}$ of $14 = ?$
$\frac{3}{7}$ of $14 = ?$
$\frac{4}{7}$ of $14 = ?$

4. $\frac{5}{7}$ of $14 = ?$
$\frac{6}{7}$ of $14 = ?$
$\frac{1}{4}$ of $16 = ?$
$\frac{3}{4}$ of $16 = ?$
$\frac{1}{8}$ of $16 = ?$

5. $\frac{3}{8}$ of $16 = ?$
$\frac{5}{8}$ of $16 = ?$
$\frac{7}{8}$ of $16 = ?$
$\frac{1}{9}$ of $18 = ?$
$\frac{2}{9}$ of $18 = ?$

6. $\frac{4}{9}$ of $18 = ?$
$\frac{5}{9}$ of $18 = ?$
$\frac{7}{9}$ of $18 = ?$
$\frac{8}{9}$ of $18 = ?$
$\frac{1}{4}$ of $20 = ?$

7. $\frac{3}{4}$ of $20 = ?$
$\frac{1}{5}$ of $20 = ?$
$\frac{2}{5}$ of $20 = ?$
$\frac{3}{5}$ of $20 = ?$
$\frac{4}{5}$ of $20 = ?$

8. $\frac{1}{7}$ of $21 = ?$
$\frac{2}{7}$ of $21 = ?$
$\frac{3}{7}$ of $21 = ?$
$\frac{4}{7}$ of $21 = ?$
$\frac{5}{7}$ of $21 = ?$

9. $\frac{6}{7}$ of $21 = ?$
$\frac{1}{4}$ of $24 = ?$
$\frac{3}{4}$ of $24 = ?$
$\frac{1}{3}$ of $24 = ?$
$\frac{2}{3}$ of $24 = ?$

10. $\frac{1}{6}$ of $24 = ?$
$\frac{5}{6}$ of $24 = ?$
$\frac{1}{8}$ of $24 = ?$
$\frac{3}{8}$ of $24 = ?$
$\frac{5}{8}$ of $24 = ?$
$\frac{7}{8}$ of $24 = ?$

11. $\frac{1}{3}$ of $27 = ?$
$\frac{2}{3}$ of $27 = ?$
$\frac{1}{9}$ of $27 = ?$
$\frac{5}{9}$ of $27 = ?$
$\frac{7}{9}$ of $27 = ?$
$\frac{8}{9}$ of $45 = ?$

12. $\frac{1}{4}$ of $28 = ?$
$\frac{3}{4}$ of $28 = ?$
$\frac{1}{5}$ of $30 = ?$
$\frac{2}{5}$ of $30 = ?$
$\frac{3}{5}$ of $30 = ?$
$\frac{4}{5}$ of $30 = ?$

13. $\frac{1}{6}$ of $30 = ?$
$\frac{5}{6}$ of $30 = ?$
$\frac{1}{4}$ of $32 = ?$
$\frac{3}{4}$ of $32 = ?$
$\frac{1}{8}$ of $32 = ?$
$\frac{5}{8}$ of $32 = ?$

14. $\frac{1}{9}$ of $36 = ?$
$\frac{4}{9}$ of $36 = ?$
$\frac{5}{9}$ of $36 = ?$
$\frac{7}{9}$ of $36 = ?$
$\frac{1}{4}$ of $40 = ?$
$\frac{3}{4}$ of $40 = ?$

15. $\frac{1}{5}$ of $40 = ?$
$\frac{3}{5}$ of $40 = ?$
$\frac{1}{8}$ of $40 = ?$
$\frac{3}{8}$ of $40 = ?$
$\frac{5}{8}$ of $40 = ?$
$\frac{7}{8}$ of $40 = ?$

See page 356.

WRITTEN EXERCISES

Add:

1. 4971
904
3700
142
36
25
9778

2. 397
8432
654
78
2109
2468
14138

3. 1379
6789
3210
2345
284
196
14203

4. 1084
839
91
5371
289
1742
9416

5. 1402
3256
4007
1799
34
862
11360

6. 927
8986
3570
934
16
422
14855

7. 6450
997
418
891
232
73
9061

8. 4911
924
978
3808
1723
51
12395

Multiply:

9. 498
36
17928

10. 2094
89
186366

11. 734
53
38902

12. 5407
685
3703795

13. 8590
275
2362250

14. 4930
296
1459280

15. 7842
397
3113274

16. 2540
652
1656080

17. 3702
309
1143918

18. 4503
471
2120913

19. 1245
189
235305

20. 3782
243
919026

Drills in Fundamentals. Select teams for a cross-country race, as on page 91. Run one race today, using examples in addition, and another tomorrow, using examples in multiplication. The team which has the lowest total score for the two races wins. If your team has a high score for the first race, you must drill on multiplication, so as to get a lower score in the second race.

See page 356.

WRITTEN EXERCISES

1. What is the cost of 100 three-cent stamps, 200 two-cent stamps and 100 one-cent stamps? **$8.00**

2. In a logging camp there are 276 horses. How many horseshoes are needed to shoe all these horses once? **1104**

3. Working in the shipyards during the war a man earned $7.50 a day. How much did he earn in 174 days? **$1305**

4. Charlie's father had 127 chickens, and sold 74 of them. How many had he left? **53**

5. One schoolroom is 27 feet wide and 36 feet long, and another is 30 feet wide and 33 feet long. Find the number of square feet in each of these. Which is the larger, and how much? **972 sq. ft.; 990 sq. ft. 2nd 18 sq. ft larger.**

6. A skilled workman gets $6.50 a day, and a common laborer gets $2.25 a day. How much less than the skilled workman does the laborer earn in one day? How much less does he earn in one month of 26 working days? **$4.25; $110.50**

7. If one quart of ice cream is enough to serve 6 people, how many quarts are needed at a picnic where there are 54 people? **9 qts.**

8. On one trip a street car conductor takes in 87 cash fares. How much money is this if one fare is 5 cents? **$4.35**

9. Make and solve problems like problem 5 on this page. See who can make the most interesting problems.

10. Make and solve problems like problem 6 on this page. Does it pay to become a skilled worker?

11. Make and solve problems about how many sandwiches are needed for a picnic.

See page 356.

Example 1. Divide 246 by 6.

41 *Tens:* 24÷6=4. Write *4*.
6)246 *Ones:* 6÷6=1. Write *1*.

Notice that the figure 4 in the quotient is written directly above the figure 4 in the dividend. That is, the first figure in the quotient is written directly above the last figure of that part of the dividend which is used in the first step.

Example 2. Divide 135 by 3.

45 *Tens:* 13÷3=4, remainder 1. Write *4*.
3)135 *Ones:* 15÷3=5. Write *5*.

The figure 4 in the quotient is written directly above the figure 3 in the dividend. Why is this done?

Example 3. Divide 1744 by 8.

218 *Hundreds:* 17÷8=2, remainder 1. Write *2*.
8)1744 *Tens:* 14÷8=1, remainder 6. Write *1*.
Ones: 64÷8=8. Write *8*.

Divide the following:

1.	92 4)368	91 5)455	91 6)546	119 7)833
2.	61 8)488	47 7)329	61 7)427	71 9)639
3.	387 3)1161	595 3)1785	476 3)1428	442 3)1326
4.	337 4)1348	1839 4)7356	941 4)3764	494 4)1976
5.	781 5)3905	684 5)3420	375 5)1875	495 5)2475
6.	227 6)1362	772 6)4632	855 6)5130	726 6)4356
7.	278 7)1946	879 7)6153	338 7)2366	469 7)3283

See page 356.

Example 1. Divide 537 by 6.

$$\begin{array}{l}\underline{89}\text{, remainder 3.}\\ 6\,)537\end{array}$$

Tens: 53 ÷ 6 = 8, remainder 5. Write *8*.
Ones: 57 ÷ 6 = 9, remainder 3. Write *9*.

Test:

$$\begin{array}{|r|}89\\ \underline{6}\\ 534\\ \underline{3}\\ 537\end{array}$$

To test, multiply 89 by 6, and add the remainder.

Example 2. Divide 3546 by 7.

$$\begin{array}{l}\underline{506}\text{, remainder 4.}\\ 7\,)3546\end{array}$$

Hundreds: 35 ÷ 7 = 5, remainder 0. Write *5*.
Tens: 4 ÷ 7 = 0, remainder 4 Write *0*.
Ones: 46 ÷ 7 = 6, remainder 4. Write *6*. The quotient is 506, and remainder 4.

Divide each of the following and test the results:

1.	$\begin{array}{r}94\\9\overline{)846}\end{array}$	$\begin{array}{r}54\text{-}4\\5\overline{)274}\end{array}$	$\begin{array}{r}43\text{-}3\\8\overline{)347}\end{array}$	$\begin{array}{r}85\text{-}5\\6\overline{)515}\end{array}$
2.	$\begin{array}{r}61\text{-}4\\7\overline{)431}\end{array}$	$\begin{array}{r}78\text{-}3\\4\overline{)315}\end{array}$	$\begin{array}{r}92\text{-}2\\5\overline{)462}\end{array}$	$\begin{array}{r}69\\9\overline{)621}\end{array}$
3.	$\begin{array}{r}488\text{-}1\\8\overline{)3905}\end{array}$	$\begin{array}{r}842\text{-}6\\7\overline{)5900}\end{array}$	$\begin{array}{r}667\text{-}1\\6\overline{)4003}\end{array}$	$\begin{array}{r}1146\text{-}7\\8\overline{)9175}\end{array}$
4.	$\begin{array}{r}58\text{-}3\\8\overline{)467}\end{array}$	$\begin{array}{r}867\text{-}1\\7\overline{)6070}\end{array}$	$\begin{array}{r}1188\text{-}5\\6\overline{)7133}\end{array}$	$\begin{array}{r}1634\\3\overline{)4902}\end{array}$
5.	$\begin{array}{r}894\text{-}4\\9\overline{)8050}\end{array}$	$\begin{array}{r}821\text{-}1\\7\overline{)5748}\end{array}$	$\begin{array}{r}660\text{-}7\\9\overline{)5947}\end{array}$	$\begin{array}{r}1271\text{-}3\\7\overline{)8900}\end{array}$
6.	$\begin{array}{r}2261\text{-}3\\4\overline{)9047}\end{array}$	$\begin{array}{r}1604\text{-}1\\5\overline{)8021}\end{array}$	$\begin{array}{r}1372\text{-}6\\7\overline{)9610}\end{array}$	$\begin{array}{r}849\text{-}8\\9\overline{)7649}\end{array}$
7.	$\begin{array}{r}531\text{-}5\\6\overline{)3191}\end{array}$	$\begin{array}{r}608\text{-}1\\3\overline{)1825}\end{array}$	$\begin{array}{r}804\text{-}4\\7\overline{)5632}\end{array}$	$\begin{array}{r}522\text{-}2\\6\overline{)3134}\end{array}$
8.	$\begin{array}{r}728\text{-}1\\4\overline{)2913}\end{array}$	$\begin{array}{r}1072\text{-}1\\5\overline{)5361}\end{array}$	$\begin{array}{r}433\text{-}7\\8\overline{)3471}\end{array}$	$\begin{array}{r}1462\text{-}1\\4\overline{)5849}\end{array}$
9.	$\begin{array}{r}1348\text{-}3\\5\overline{)6743}\end{array}$	$\begin{array}{r}619\text{-}5\\6\overline{)3719}\end{array}$	$\begin{array}{r}193\text{-}7\\9\overline{)1744}\end{array}$	$\begin{array}{r}1049\text{-}3\\7\overline{)7346}\end{array}$

See page 356.

WRITTEN EXERCISES

1. The number of children attending a certain school for one week was:

Monday......	846
Tuesday......	852
Wednesday...	845
Thursday.....	860
Friday.......	842

Add these numbers and divide the sum by 5. The quotient is the *average* daily attendance for the week. We divide by 5 because 5 numbers were added. If we add the attendance for 20 days, the sum must be divided by 20 to get the average for that time.

4245 ÷ 5 = 849

In two other schools the attendance for one week was:

2. The John Marshall:

Monday..........	1484
Tuesday..........	1506
Wednesday.......	1512
Thursday.........	1502
Friday............	1481

7485 ÷ 5 = 1497

3. The Calhoun:

Monday...........	672
Tuesday...........	691
Wednesday........	693
Thursday..........	680
Friday.............	674

3410 ÷ 5 = 682

Find the average daily attendance at each of these schools for the week.

4. Ask the teacher what the attendance in your room was each day last week. Then find the average daily attendance.

5. At a series of baseball games the attendance was: 8685, 9424, 12802, 23689. Find the average attendance for these four days. **54600 ÷ 4 = 13650**

6. A farmer sold 6 horses at the following prices: $130, $185, $150, $165, $200, $160. What was the average price of these horses? **$990 ÷ 6 = $165**

7. If 8 pigs sold for $216, what was the average price? **$27**

See page 356.

ORAL EXERCISES

1. How could you find the average daily attendance in your school for 20 days?

2. John and Harry have some money. How can you find how much more one has than the other?

3. How can you find how many school children there are in a 10-room building?

4. Your mother bought some cloth. If she tells you how many yards she bought and how much she paid per yard how can you find how much the cloth cost her?

5. If you measure one side of a square how can you find the distance around the square?

6. Tom has some money and wants to buy a pair of skates. If he knows the price of the skates, how can he tell how much more money he must get to buy them?

7. A farmer wants to buy some horses. If he knows the price per head how can he tell how much the horses will cost?

8. How can you tell how much older a father is than his son?

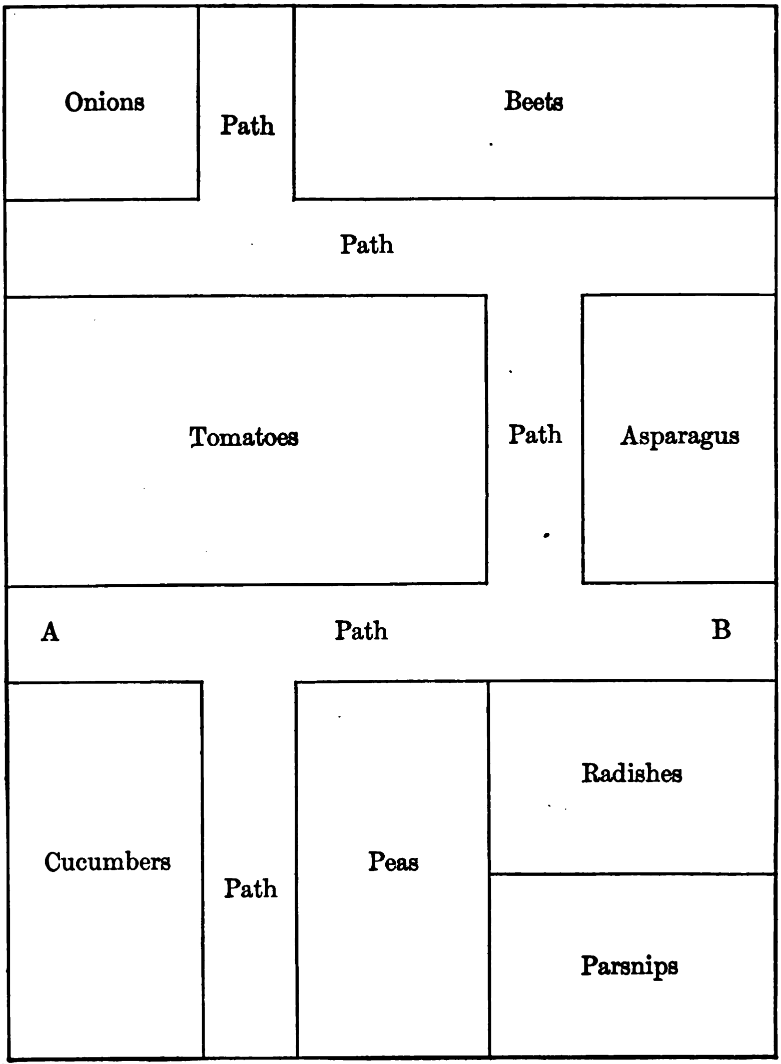
9. A girl wants to buy five Christmas presents. How can she tell how much they will cost all together?

10. Tell some uses you know for large numbers.

11. If you know how old a man is how can you find in what year he was born?

12. A man hauling coal weighs the wagon with the coal on and then weighs the empty wagon. How can you tell how many pounds of coal he had on? Make and solve problems like this. Compare pages 118 and 119.

See page 356.


Onions
Path
Beets
Path
Tomatoes
Path
Asparagus
A
Path
B
Cucumbers
Path
Peas
Radishes
Parsnips

See page 356.

ORAL AND WRITTEN EXERCISES

On the diagram on the opposite page one inch represents 6 feet.

1. What are the dimensions of the beet bed? How many square feet are there in it? How many yards wide is it? how many yards long? How many square yards are there in it? **15′×6′; 90 sq. ft.; 2 yd. by 5 yd.; 10 sq. yd.**
2. What are the dimensions of the onion bed in feet?. How many square feet are there in it? how many square yards? **6′×6′; 36; 4 sq. yd.**
3. What are the dimensions of the tomato bed in feet? How many square feet are there in it? how many square yards? **9′×15′; 135; 15 sq. yd.**
4. How many square feet are there in the asparagus bed? How many square yards? **54; 6**
5. What are the dimensions of the radish bed? How many square yards are there in it? **6′×9′; 6**
6. What are the dimensions of the parsnip bed? How many square yards are there in it? **6′×9′; 6**
7. Give the dimensions of the cucumber bed. How many square yards are there in it? **6′×12′; 8**
8. How wide are the paths? How long is the path from A to B? How many square yards are there in this path? **3 ft.; 24 ft.; 8 sq. yd.**
9. How many square yards are there in the whole garden, including the paths? **88 sq. yd.**
10. If the vegetable beds cover 63 square yards, how much is covered by the paths? **25 sq. yd.**
11. Make problems about the peas bed.

See page 356.

WRITTEN EXERCISES

Copy the following examples and add them. Check by adding each column both ways.

1. 52346
52435
324
6532
54623
166260

2. 76895
8957
98576
57984
652
243064

3. 85679
59786
8568
265
35471
189769

4. 96432
9873
7420
3190
18462
135377

5. 65748
79854
860
8476
70549
94631
320118

6. 89675
543
40087
37903
9046
98007
275261

7. 97654
8975
8973
60087
59856
887
236432

8. 27304
16413
29870
61324
4926
39840
179677

Make the following subtractions; note the time it takes:

9. 453621
360453
93168

10. 576814
287065
289749

11. 645234
576428
68806

12. 38704
12172
26532

13. 578091
287496
290595

14. 781046
693567
87479

15. 874063
640785
233278

16. 672400
126382
546018

17. 70504
36085
34419

18. 81030
68947
12083

19. 904160
736974
167186

20. 397026
129142
267884

21. 87003
70894
16109

22. 907631
578908
328723

23. 79087
59898
19189

24. 73400
46198
27202

25. 94201
24274
69927

26. 5746
4193
1553

27. 78401
34719
43682

28. 19846
2948
16898

See page 357.

Copy the following. See how long it takes you to do them.

1. 86954 467 40607518	2. 79506 547 43489782	3. 87954 638 56114652	4. 96785 657 63587745
5. 95874 578 55415172	6. 78970 659 52041230	7. 89705 708 63511140	8. 38965 980 38185700
9. 8976 895 8033520	10. 9784 878 8590352	11. 7869 984 7743096	12. 9567 893 8543331
13. 7041 391 2753031	14. 6394 472 3017968	15. 2530 843 2132790	16. 3987 258 1028646

Divide the following, giving quotients and remainders:

12015-2 17. 4)48062	1500 18. 5)7500	14567-3 19. 6)87405
47846-5 20. 7)334927	57060-3 21. 8)456483	53133-3 22. 9)478200
89601 23. 9)806409	133861-1 24. 7)937028	106365 25. 8)850920
117597-4 26. 8)940780	96737-7 27. 9)870640	108955-5 28. 9)980600
315500 29. 6)1893000	359272-1 30. 4)1437089	175760-5 31. 8)1406085
1740-4 32. 5)8704	1120-4 33. 8)8964	16947-3 34. 4)67791
848-2 35. 7)5938	709-3 36. 6)4257	2826-2 37. 7)19784

Drill in Fundamentals. Choose teams for field meet; play as on page 195. First event will be in addition, second in subtraction, third in multiplication, fourth in division.

See page 357.

ORAL AND WRITTEN EXERCISES

1. How many inches are there in one yard? in a half-yard? 36; 18

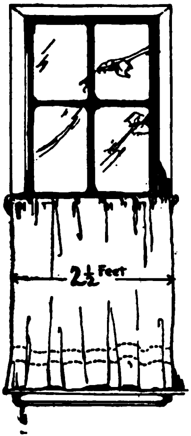
2. If linen handkerchiefs are cut 18 inches long and 18 inches wide before hemming, how many can be made from a piece of linen one yard square? 4

3. How many handkerchiefs like those of Example 2 can be made from a piece 1 yard wide and 3 yards long? 12

4. How many ladies' handkerchiefs each 12 inches square before hemming can be cut from a piece of linen 1 yard square? 9

5. How many handkerchiefs like those of Example 4 can be made from a piece of linen 1 yard wide and 2 yards long? 18

6. How many ladies' handkerchiefs each 9 inches square can be cut from a piece of linen 1 yard square? 16



7. How wide a sash curtain is needed for this window, if it is made twice as wide as the window to allow for fulness? 5 ft.

8. A tablecloth 72 inches wide, is how many feet wide? how many yards? 6; 2

9. How many feet of sheeting are required to make 2 sheets, each 7½ feet long before hemming? How many yards is this? It is understood that the sheeting is the same width as the sheets. 15; 5

10. If it takes 2½ yards of goods to make an apron for one of the girls in a cooking class, how much goods will it take to make aprons for 4 girls? 10

See page 359.

ORAL AND WRITTEN EXERCISES

1. Draw a rectangle 6 inches long and 4 inches wide. Divide it into square inches. How many square inches are there in it? Could you find this without counting? how?

2. How many square inches are there in a sheet of paper 9 inches long and 6 inches wide?

You can easily understand that we cannot find the area of a large surface by dividing it up into squares and counting them, because that would take too much time.

To find the area of a rectangle in square feet, multiply its length in feet by its width in feet.
To find the area of a rectangle in square yards, multiply its length in yards by its width in yards.

3. How long is your blackboard? how wide? Find its area in square feet.

4. Give a rule for finding the number of square inches in a rectangle.

5. Find the number of square inches in the top of your desk.

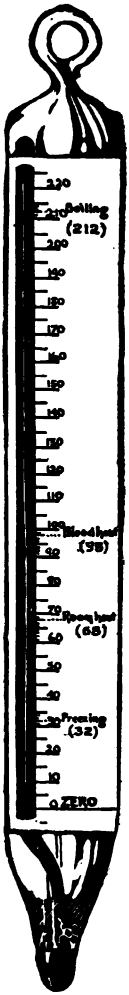
6. How many square yards are there in a rug 3 yards wide by 4 yards long? At $3.50 a square yard, how much is this rug worth? **12; $42.00**

7. How many square yards are there in a rug 6 feet wide by 9 feet long? At $5.25 a square yard, how much is this rug worth? **6 sq. yds.; $31.50**

8. If you know the length of a rectangle in feet and width in yards, how do you find its area in square feet?

See page 359

ORAL AND WRITTEN EXERCISES



See page 360.

Answer as many as you can of the following questions without using pencil and paper.

1. How many degrees above zero is the freezing point?
2. How many degrees above zero is blood heat?
3. How many degrees above the room temperature is blood heat? 30
4. How many degrees are there between the freezing point and blood heat? 66
5. How many degrees are there between blood heat and the boiling point? 114
6. How many degrees above zero is the boiling point? 212
7. How many degrees above freezing is the boiling point? 180
8. One year the lowest temperature in Boston was 24° below zero, and the highest was 97° above zero. What is the difference between these temperatures? 121
9. What is the highest temperature you ever saw on the thermometer? the lowest? What is the difference between these?
10. What is the temperature which is half-way between the boiling and the freezing points? Point out this temperature on the thermometer. 122

WRITTEN WORK

1. A railway train runs from New York through Albany to Buffalo. In going from New York to Albany the train runs 143 miles, while in going from New York to Buffalo it runs 440 miles. How many miles are there from Albany to Buffalo? **297**

2. If there are 897 girls and 689 boys in a certain school, how many more girls than boys are there in this school? How many pupils are there altogether in the school? **208; 1586**

3. If you buy goods for $1.78, what change do you get from a five-dollar bill? **$3.22**

4. If you receive $4.24 in change from a ten-dollar bill, what was the amount of your purchase? **$5.76**

5. In what year was a man born who is 45 years old now?

6. Lincoln died in 1865. How many years ago was that?

7. A man received $1600 a year in salary. He spent $280 a year for rent, $310 for table board, $175 for clothing, $350 for tools, $250 for other purposes, and saved the rest. How much did he spend for all these? How much did he save? **$1365; $235**

8. A drawing 8 inches long and 2 inches wide, represents a city lot. What are the dimensions of the lot if 1 inch represents 15 feet? Find the number of square feet in this lot. **30 ft. by 120 ft.; 3600 sq. ft.**

9. If the daily attendance in a certain school for one week is 485, 508, 512, 497, 498, what is the average daily attendance for that week? **500**

10. How old is a man now if he was born in the year 1867?

11. Make other problems like Problem 10 and solve them.

See page 360.

WRITTEN WORK

1. General Grant was born in the year 1822, and died in the year 1885. How old was he at the time of his death? **63 yrs.**

2. How many years ago was General Grant born? How many years ago did he die?

3. Lincoln was born in the year 1809, and died in the year 1865. How old was he at the time of his death? **56 yrs.**

4. A school yard is 170 feet by 180 feet. What length of fence is required to go around it? **700 ft.**

5. A room is 15 feet long and 12 feet wide. How long is the picture molding around it? **54 ft.**

6. How many square yards of carpet are required for a room 5 yards by 4 yards? **20**

7. If oranges sell at the rate of 3 for 10 cents, how much will one dozen oranges cost? **40¢**

8. At the rate of 2 for 5 cents, how much will one dozen oranges cost? **30¢**

9. If you buy 2 dozen bananas and get 40 cents change from a one-dollar bill, how much do you pay for the bananas? At this rate what is the cost of one dozen bananas? of a half-dozen? **60¢; 30¢; 15¢**

10. Six men do some work for $336. How much does each receive if this is divided equally? **$56.00**

11. If the picture molding around a square room is 56 feet long, what are the dimensions of the room? **14 ft. square**

12. A certain motor boat runs 11 miles on a gallon of gasoline. How many miles will it run on 6 gallons? How many miles will it run on 140 gallons? **66; 1540**

See page 360.

WRITTEN WORK

1. Make out laundry bills for the following, using your mother's name and the name of your own laundry.
   - (*a*) 4 collars at 3¢, 2 shirts at 12¢, 1 nightshirt at 10¢, 2 pieces of underwear at 8¢, 2 pairs of socks at 4¢, 3 handkerchiefs at 2¢. **$.76**
   - (*b*) One petticoat 30¢, 2 nightdresses at 15¢, 2 combination suits at 20¢, one wrapper 35¢. **$1.35**
   - (*c*) 16 towels at 4¢, 6 sheets at 5¢, 8 pillow cases at 3¢. **$1.18**

2. A lady bought a bill of goods for $11.35, and gave the clerk a $10 bill and a $5 bill. How much change did she receive? How would the clerk count out the change? **$3.65**

3. A man owed $34.47 at a store. He paid $28.50. How much did he still owe? **$5.97**

4. During one summer season a certain motor boat ran 1712 miles. At 8 miles to the gallon, how many gallons of gasoline did it use? **214**

5. Find the cost of 214 gallons of gasoline at 27 cents a gallon. **$57.78**

6. A farmer sold 7 bushels of potatoes at $1.65, and 9 bushels at $1.15. Which sale brought more money? how much? **Former; $1.20**

7. A pane of glass is 18 inches wide by 27 inches long. How many square inches does it contain? **486**

8. A rectangular drawing 4 inches wide and 7 inches long represents a garden. What are the dimensions of the garden if 1 inch represents 5 feet? **20 ft. x 35 ft.**

9. A lot is 48 feet wide and 120 feet long. How many square feet are there in this lot? How many square yards are there in it? **5760; 640**

See page 360.

WRITTEN WORK

1. For a school entertainment 173 tickets were sold at 50 cents apiece, 218 tickets at 25 cents apiece, and 312 children's tickets at 10 cents. How much did the entertainment bring? **$172.20**

2. The expenses of the school entertainment of Problem 1 were as follows: Printing tickets and programs, $12.50. Advertising, $15. Running the stereopticon, $2.50. Other expenses, $11.40. What were the total expenses? **$41.40**

3. John has 95 cents in dimes and nickels. What is the smallest possible number of coins he can have? **10**

4. If John has 90 cents in quarters, dimes and nickels, what is the smallest possible number of coins he can have? **5**

5. Harry has $1.45 in silver. What is the smallest possible number of coins he can have? Name the coins. **1 dollar; 1 quarter; 2 dimes**

6. A farmer starting a stock farm buys 6 cows at $85 apiece, 4 cows at $75 apiece, and 7 cows at $95 apiece. How much do all the cows cost him? **$1475**

7. A farmer bought one horse for $240, one for $150, one for $180, and two at $160 per head. What was the cost of all these horses? **$890**

8. If sugar sells at the rate of 4 pounds for 25 cents, how much will 100 pounds cost when bought at this rate? How much does a woman save by buying a 100-pound sack of sugar for $5.70? **$6.25; $.55**

9. At 64 cents a yard, what is the cost of 16 yards of cloth? If a twenty-dollar bill is used to pay for this cloth what is the change received? How would you count out this change? **$10.24; $9.76**

See page 361.

CHAPTER V

Review of Reading Numbers

Read the following numbers:

1. 859,047
807,040
6,347,000
1,843,000
3,106,830
61,009
3,340
187,640
5,940,074
1,603,894
14,080
59,040
917,300
6,937,421
4,314,700

For special purposes numbers are sometimes read in different ways. Thus, when 138 is used for a house number, it is read "one thirty-eight," 2476 is read "twenty-four, seventy-six," 5700 is read "fifty-seven hundred," while 4307 is read "forty-three O seven." The *0* is read "O" as in the alphabet, and not as zero.

2. Read the following numbers as house numbers are read:

7340
6176
6004
1500
5006
4590
4972
7400
7002
3700
2569
8045
5000
3500
5031
4325
5700
3407
1370
7640

Telephone numbers are read still another way. Thus, when 138 is used for a telephone number, it is read "One, three, eight," 2476 is read "two, four, seven, six," 405 is read "four, O, five." The *0* is read as "O" in the alphabet, and not as zero. 7800 is read "seven eight double O," and 3007 is read "three double O seven."

3. Read the numbers in Example 2 as telephone numbers are read.

See page 361.

Copy and add the following:

1. 6947	2. 5820	3. 194	4. 55
280	340	8600	678
6240	6496	914	901
9000	348	37	2345
53	29	1740	6789
267	167	617	10234
82	8239	83	56789
907	390	2406	5371
23776	21829	14591	83162

Subtract and prove your results in the following:

5. 9147	6. 6300	7. 7842	8. 6070
6849	4126	5936	4869
2298	2174	1906	1201
9. 3406	10. 8190	11. 3851	12. 6378
2142	3476	1789	2496
1264	4714	2062	3882

Multiply:

13. 219	14. 734	15. 5910	16. 6408
86	76	282	294
18834	55784	1666620	1883952
17. 689	18. 4706	19. 3005	20. 7070
27	208	206	809
18603	978848	619030	5719630

Divide and prove your results in the following:

141-7	2605-5	879	1234-2
21. 9)1276	22. 7)18240	23. 6)5274	24. 5)6172
10005-2	81197-1	7057-5	6003
25. 9)90047	26. 4)324789	27. 6)42347	28. 8)48024

Drill in Fundamentals. Play the game on page 195. Run two events, using examples in multiplication for the first event, and examples in division for the second.

See page 361.

ORAL EXERCISES

1. Do you know what game these boys are playing? How many play on each side? How many boys are required to form two football teams? three teams? four teams?

2. Count to 110 by 11's.

3. Read the following and supply the missing numbers:

2×11 = ?
3×11 = ?
4×11 = ?
5×11 = ?
6×11 = ?
7×11 = ?
8×11 = ?
9×11 = ?
10×11 = ?

4. How many are there in one dozen? in 2 dozen? in 3 dozen? in 4 dozen?

5. Count to 120 by 12's.

6. Read the following and supply the missing numbers:

2×12 = ?
3×12 = ?
4×12 = ?
5×12 = ?
6×12 = ?
7×12 = ?
8×12 = ?
9×12 = ?
10×12 = ?

7. What are the new number facts in these tables?

See page 361.

Study again the figure on page 133 and the number facts related to $7 \times 6 = 42$.

From $6 \times 11 = 66$ we know at once that $11 \times 6 = 66$, $\frac{1}{6}$ of $66 = 11$, $\frac{1}{11}$ of $66 = 6$, $66 \div 6 = 11$, $66 \div 11 = 6$.

ORAL AND WRITTEN EXERCISES

1. Write down each number fact in the table of 11's and state what other number facts are obtained from each.

2. Write down each number fact in the table of 12's and state what other number facts are obtained from each.

3. Give the missing numbers in the following:

$77 \div 11 = ?$
$48 \div 12 = ?$
$44 \div 4 = ?$
$72 \div 12 = ?$
$99 \div 9 = ?$
$24 \div 2 = ?$
$33 \div 3 = ?$
$48 \div 4 = ?$
$44 \div 11 = ?$
$36 \div 12 = ?$
$120 \div 10 = ?$

$110 \div 11 = ?$
$108 \div 9 = ?$
$22 \div 11 = ?$
$96 \div 12 = ?$
$66 \div 11 = ?$
$96 \div 8 = ?$
$55 \div 5 = ?$
$84 \div 7 = ?$
$60 \div 12 = ?$
$88 \div 8 = ?$
$66 \div 6 = ?$

$55 \div 11 = ?$
$84 \div 12 = ?$
$77 \div 7 = ?$
$72 \div 6 = ?$
$110 \div 10 = ?$
$60 \div 5 = ?$
$88 \div 11 = ?$
$120 \div 12 = ?$
$99 \div 11 = ?$
$108 \div 12 = ?$
$36 \div 12 = ?$

4. Make question cards and answer cards for the tables of 11's and 12's, and play the game on page 103.

5. Play the same game, using the cards for the 11's and 12's mixed with cards for the other tables.

Drill in Fundamentals. Play the game on page 71, using combinations like $\frac{1}{12}$ of $36 = ?$ The girls will play against the boys. Find the average number of mistakes for the boys and the average number for the girls. If necessary, the teacher will show how to find these.

See page 362.

We are now to learn a process called *long division.* It is exactly like short division, except that more of the work is written down.

We will first study this process in a simple example, which we can also work by short division. In this way we shall be able to see that there is nothing new in long division except that it saves the remembering of so many figures.

Example. Divide 674 by 8.

$$\begin{array}{r l} 84 & \text{(quotient)} \\ 8\overline{)674} & \\ \underline{64} & \\ 34 & \\ \underline{32} & \\ 2 & \text{(remainder)} \end{array}$$

Tens: $67 \div 8 = 8$, remainder 3.
Write *8* in quotient and bring down 4.
Ones: $34 \div 8 = 4$, remainder 2.
Write *4* in quotient.

The quotient is 84, and the remainder 2.

To find the first remainder multiply the divisor by the first figure of the quotient. That is, $8 \times 8 = 64$. Subtract the product from 67.

To find the second remainder multiply the divisor by the second figure of the quotient. That is, $4 \times 8 = 32$. Then subtract from 34.

WRITTEN EXERCISES

Solve each of the following by long division and also by short division, and study the two processes with care.

1. $6\overline{)497}$(82-5)
2. $7\overline{)598}$(85-3)
3. $8\overline{)748}$(93-4)
4. $5\overline{)396}$(79-1)
5. $6\overline{)475}$(79-1)
6. $9\overline{)627}$(69-6)
7. $9\overline{)886}$(98-4)
8. $4\overline{)396}$(99)
9. $8\overline{)747}$(93-3)
10. $6\overline{)538}$(89-4)
11. $7\overline{)675}$(96-3)
12. $9\overline{)796}$(88-4)

In practice long division is used only when the divisor is greater than 12.

See page 362.

We will now study the steps in long division more carefully by means of an example.

Example. Divide 884 by 21.

$$\boxed{\begin{array}{r} 42 \\ 21\,\overline{)884} \\ \underline{84} \\ 44 \\ \underline{42} \\ 2 \end{array}}$$

Step 1. *Find the first partial dividend.* For the first dividend take just enough from the left of the given dividend so that the divisor is contained in it.

In this case 88 is the first partial dividend. 8 would be too small, and 884 would be larger than necessary.

Step 2. *Estimate the quotient.* In this case $88 \div 21 = 4$ with a remainder.

Step 3. *Multiply the divisor by the estimated quotient.* In this case $4 \times 21 = 84$.

Step 4. *Compare product with first partial dividend.*

If the product is greater than the first dividend, the quotient is too large.

Step 5. *Subtract product.*

If the remainder is less than the divisor, the quotient figure is correct; if not, the quotient is too small.

Step 6. *Bring down one figure from the dividend to form the next partial dividend, and repeat the above steps.*

Remember: *The product of the quotient figure and the divisor must not be greater than the partial dividend.*

Every remainder must be less than the divisor.

WRITTEN EXERCISES

Divide and explain all steps:

1. $21\overline{)588}$(28)
2. $21\overline{)945}$(45)
3. $21\overline{)735}$(35)
4. $21\overline{)651}$(31)
5. $21\overline{)861}$(41)
6. $21\overline{)483}$(23)
7. $21\overline{)798}$(38)
8. $21\overline{)966}$(46)

See page 362.

Example. Divide 987 by 42.

$$\begin{array}{r} 23 \\ 42\overline{)987} \\ \underline{84} \\ 147 \\ \underline{126} \\ 21 \end{array}$$

Tens: 98÷42=2, with a remainder. Write *2* in quotient.

2×42=84. Subtract and bring down 7 for next partial dividend.

Ones: 147÷42=3, with a remainder. Write *3* in quotient.

The quotient is 23 and the remainder 21. Explain how the remainder is found. Compare short division.

Notice that, as in short division, the first figure of the quotient is placed directly above the last figure of the first partial dividend, in this case above the 8.

Test:

$$\begin{array}{r} 42 \\ \underline{23} \\ 126 \\ \underline{84} \\ 966 \\ \underline{21} \\ 987 \end{array}$$

To test, multiply the divisor by the quotient and add the remainder. The result should be the dividend.

WRITTEN EXERCISES

Divide and test the following:

41-15
1. 21)876

28-6
2. 21)594

24-21
3. 31)765

13-15
4. 31)418

42-2
5. 22)926

43
6. 23)989

37-12
7. 23)863

34-3
8. 23)785

25-9
9. 33)834

12-2
10. 33)398

33-2
11. 24)794

36-11
12. 24)875

38-20
13. 24)932

19-35
14. 41)814

23-10
15. 42)976

17-9
16. 51)876

17-50
17. 52)934

13-35
18. 61)828

13-63
19. 71)986

12-30
20. 72)894

28-20
21. 32)916

17-32
22. 42)746

16-44
23. 52)876

14-49
24. 62)917

See page 362.

The most difficult step in long division is to estimate the figures of the quotient.

To estimate the quotient figure when the divisor is a two-figure number *take quotient of tens.*

Example 1. Divide 849 by 91.

$$\begin{array}{r} 9 \\ 91\overline{)849} \\ \underline{819} \\ 30 \end{array}$$

There are 9 tens in 91 and 84 tens in 849. Since $84 \div 9 = 9$ with a remainder, we estimate 9 as the quotient figure. Is this correct? How do you know?

Use this method when the second figure of the divisor is small.

Sometimes this method gives a quotient figure 1 too large. Thus, in $812 \div 91$, the quotient figure apparently is 9, while on trial we find it to be 8. In estimating try to notice cases like this and make the correct estimate.

Example 2. Divide 746 by 89.

$$\begin{array}{r} 8 \\ 89\overline{)746} \\ \underline{712} \\ 34 \end{array}$$

Since 89 is nearly 90, and since $74 \div 9 = 8$ with a remainder, we estimate 8 as the quotient figure. On multiplying and subtracting this proves correct.

Use this method when the second figure in the divisor is large.

Sometimes this method gives a quotient figure 1 too small.

ORAL AND WRITTEN EXERCISES

Estimate the quotients below. After having estimated all of them, test to see how many you have correct. Try to make the first estimate accurately and rapidly

1. $41\overline{)392}$(9–)
2. $62\overline{)471}$(7–)
3. $89\overline{)651}$(7–)
4. $49\overline{)334}$(6–)
5. $51\overline{)378}$(7–)
6. $42\overline{)237}$(5–)
7. $39\overline{)289}$(7–)
8. $82\overline{)786}$(9–)
9. $59\overline{)414}$(7–)
10. $69\overline{)628}$(9–)
11. $52\overline{)478}$(9–)
12. $79\overline{)689}$(8–)

See page 362.

Example 1. Divide 676 by 29.

$$\begin{array}{r} 23 \\ 29\overline{)676} \\ \underline{58} \\ 96 \\ \underline{87} \\ 9 \end{array}$$

Tens: 67 (tens) ÷ 29 = 2 (tens), remainder 9 (tens). Write *2*. Bring down 6.

Ones: 96 ÷ 29 = 3, remainder 9. Write *3*.

The quotient is 23, remainder 9.

Test:

$$\begin{array}{r} 23 \\ \underline{29} \\ 207 \\ \underline{46} \\ 667 \\ \underline{9} \\ 676 \end{array}$$

Example 2. Divide 8476 by 39.

$$\begin{array}{r} 217 \\ 39\overline{)8476} \\ \underline{78} \\ 67 \\ \underline{39} \\ 286 \\ \underline{273} \\ 13 \end{array}$$

Hundreds: 84 ÷ 39 = 2, remainder 6. Write *2*, bring down 7.

Tens: 67 ÷ 39 = 1, remainder 28. Write *1*, bring down 6.

Ones: 286 ÷ 39 = 7, remainder 13. Write *7*.

The quotient is 217, remainder 13.

WRITTEN EXERCISES

Divide and test:

1. $49\overline{)814}$ (16-30)
2. $48\overline{)536}$ (11-8)
3. $38\overline{)918}$ (24-6)
4. $39\overline{)796}$ (20-16)
5. $49\overline{)586}$ (11-47)
6. $68\overline{)848}$ (12-32)
7. $58\overline{)648}$ (11-10)
8. $79\overline{)889}$ (11-20)
9. $59\overline{)7964}$ (134-58)
10. $79\overline{)8792}$ (111-23)
11. $89\overline{)9895}$ (111-16)
12. $98\overline{)1819}$ (18-55)
13. $99\overline{)9467}$ (95-62)
14. $38\overline{)8862}$ (233-8)
15. $68\overline{)9964}$ (146-36)
16. $78\overline{)8994}$ (115-24)
17. $28\overline{)765}$ (27-9)
18. $88\overline{)8432}$ (95-72)
19. $49\overline{)969}$ (19-38)
20. $58\overline{)674}$ (11-36)
21. $68\overline{)892}$ (13-8)
22. $79\overline{)9264}$ (117-21)
23. $89\overline{)9889}$ (111-10)
24. $99\overline{)1246}$ (12-58)

See page 363.

We have studied division by numbers like 41, 42, in which the second figure is small, and by numbers like 58, 59, in which the second figure is large. In these cases we have found it fairly easy to estimate the quotient figures.

With divisors such as 76 it is more difficult to estimate the quotient figures.

Example 1. Divide 613 by 76.

$$\begin{array}{r} 8 \\ 76\overline{)613} \\ \underline{608} \\ 5 \end{array}$$

In this case it is not so easy to decide at once whether 8 or 7 is the correct quotient. It the dividend were a little smaller, as 604 for instance, the quotient would be 7.

Example 2. Divide 749 by 94.

$$\begin{array}{r} 7 \\ 94\overline{)749} \\ \underline{658} \\ 91 \end{array}$$

In this case taking quotient of tens given, $74 \div 9 = 8$. But on multiplying we shall find $8 \times 94 = 752$, which is greater than the divisor, and hence 7 is the correct quotient figure.

When using divisors like those of Examples 1 and 2 we need to take special care to get the first estimate of the quotient figure correct.

ORAL AND WRITTEN EXERCISES

Estimate the quotients below, and make a list of your estimates. Then test to see how many are correct.

1. $45\overline{)365}$ (8–)
2. $56\overline{)427}$ (7–)
3. $84\overline{)726}$ (8–)
4. $96\overline{)627}$ (6–)
5. $57\overline{)472}$ (8–)
6. $64\overline{)534}$ (8–)
7. $43\overline{)245}$ (5–)
8. $95\overline{)725}$ (7–)
9. $87\overline{)572}$ (6–)
10. $77\overline{)257}$ (3–)
11. $74\overline{)478}$ (6–)
12. $53\overline{)506}$ (9–)
13. $67\overline{)394}$ (5–)
14. $87\overline{)276}$ (3–)
15. $65\overline{)573}$ (8–)
16. $33\overline{)267}$ (8–)
17. $83\overline{)726}$ (8–)
18. $76\overline{)627}$ (8–)
19. $56\overline{)514}$ (9–)
20. $87\overline{)814}$ (9–)
21. $85\overline{)777}$ (9–)
22. $47\overline{)424}$ (9–)
23. $54\overline{)459}$ (8–)
24. $77\overline{)564}$ (7–)
25. $84\overline{)781}$ (9–)
26. $56\overline{)476}$ (8–)
27. $47\overline{)381}$ (8–)
28. $34\overline{)276}$ (8–)

See page 363.

Example 1. Divide 6328 by 84.

$$\begin{array}{r} 75\\ 84\overline{)6328}\\ \underline{588}\\ 448\\ \underline{420}\\ 28 \end{array}$$

Tens: 632 (tens) ÷ 84 = 7 (tens), remainder 44 (tens). Write *7*. Bring down 8.

Ones: 448 ÷ 84 = 5, remainder 28. Write *5*.

The quotient is 75, remainder 28.

Example 2. Divide 9876 by 57.

$$\begin{array}{r} 173\\ 57\overline{)9876}\\ \underline{57}\\ 417\\ \underline{399}\\ 186\\ \underline{171}\\ 15 \end{array}$$

Hundreds: 98 ÷ 57 = 1, remainder 41. Write *1*. Bring down 7.

Tens: 417 ÷ 57 = 7, remainder 18. Write *7*. Bring down 6.

Ones: 186 ÷ 57 = 3, remainder 15.

The quotient is 173, remainder 15.

WRITTEN EXERCISES

Divide and test.

1. $54\overline{)1794}$ (33-12)
2. $67\overline{)4236}$ (63-15)
3. $84\overline{)5791}$ (68-79)
4. $56\overline{)892}$ (15-52)
5. $43\overline{)943}$ (21-40)
6. $64\overline{)2487}$ (38-55)
7. $87\overline{)3986}$ (45-71)
8. $93\overline{)5284}$ (56-76)
9. $85\overline{)3194}$ (37-49)
10. $95\overline{)1864}$ (19-59)
11. $97\overline{)4976}$ (51-29)
12. $66\overline{)6287}$ (95-17)
13. $77\overline{)4184}$ (54-26)
14. $45\overline{)3758}$ (83-23)
15. $44\overline{)3189}$ (72-21)
16. $37\overline{)8594}$ (232-10)
17. $75\overline{)3468}$ (46-18)
18. $86(\overline{14978}$ (174-14)
19. $76\overline{)19862}$ (261-26)
20. $37\overline{)2689}$ (72-25)
21. $43\overline{)9876}$ (229-29)
22. $53\overline{)37914}$ (715-19)
23. $63\overline{)18462}$ (293-3)
24. $74\overline{)26482}$ (357-64)
25. $57\overline{)26892}$ (471-45)
26. $67\overline{)7842}$ (117-3)
27. $77\overline{)74818}$ (971-51)
28. $87\overline{)74426}$ (855-41)
29. $97\overline{)28462}$ (293-41)
30. $84\overline{)7859}$ (93-47)
31. $94\overline{)59378}$ (631-64)
32. $74\overline{)25492}$ (344-36)
33. $64\overline{)37476}$ (585-36)
34. $54\overline{)8573}$ (158-41)
35. $44\overline{)8913}$ (202-25)
36. $34\overline{)15978}$ (469-32)

See page 363.

Example 1. Divide 39804 by 76.

523
76)39804
380
180
152
284
228{56

Notice that the zero in the dividend is brought down just like any other figure.

The quotient is 523; remainder 56.

Example 2. Divide 78106 by 86.

908
86)78106
774
706
688{18

Hundreds: 781 ÷ 86 = 9 with a remainder. Write *9*.
Tens: 70 ÷ 86 = 0 with a remainder. Write *0*.
Ones: 706 ÷ 86 = 8 with a remainder. Write *8*.

If after bringing down a figure the partial dividend is still less than the divisor, write *0* in the quotient and bring down another figure from the dividend.

Divide:

WRITTEN EXERCISES

1183-58
1. 74)87600
1035-55
2. 68)70435
1093-29
3. 38)41563
206-50
4. 67)13852
2103-16
5. 35)73621
2031-46
6. 48)97534
1080-22
7. 54)58342

2955-6
8. 79)233451
516-23
9. 35)18083
609
10. 45)27405
2007-18
11. 53)106389
2045-17
12. 26)53187
84-36
13. 58)4908
26-10
14. 43)1128

27-26
15. 76)2078
34-42
16. 67)2320
4002
17. 33)132066
76-15
18. 27)2067
3004
19. 56)168224
48-58
20. 72)3514
5005
21. 48)240240

e page 364.

Example 1. Divide 398000 by 1700.

$$\begin{array}{r} 234 \\ 17\cancel{00})\overline{3980\cancel{00}} \\ 34 \\ \hline 58 \\ 51 \\ \hline 70 \\ 68 \\ \hline \{200 \end{array}$$

First cancel the same number of zeros in the dividend and the divisor, and then divide as usual. Annex to the remainder the zeros cancelled in the dividend.

The quotient is 234; remainder 200.

Example 2. Divide 598425 by 7300.

$$\begin{array}{r} 81 \\ 73\cancel{00})\overline{5984\cancel{25}} \\ 584 \\ \hline 144 \\ 73 \\ \hline 7125 \end{array}$$

Cancel all the zeros in the divisor, and the same number of figures in the dividend. Divide as usual, and then annex to the remainder the figures cancelled in the dividend.

The quotient is 81; remainder 7125

Notice that only zeros at the end of the divisor can be cancelled. The zeros in 84002 cannot be cancelled.

WRITTEN EXERCISES

147-520
1. 840)124000

21-4127
2. 6300)136427

134-166
3. 650)87266

56-1008
4. 3400)191408

381-117
5. 450)171567

531-391
6. 820)435811

62-22980
7. 73000)4548980

514-95
8. 360)185135

72-435
9. 970)70275

38-1450
10. 5700)218050

47-410
11. 2800)132010

614-1620
12. 5400)3317220

528-2800
13. 3400)1798000

41-456
14. 5300)217756

30-6470
15. 86000)2586470

30-367
16. 670)20467

38-478
17. 830)32018

60-8
18. 470)28208

6-5324
19. 5400)37724

40-90
20. 970)38890

5-270
21. 6500)32770

See page 364.

ORAL AND WRITTEN EXERCISES

1. Do you live more or less than one mile from your school?

2. Do you know of a place 5 miles from your house? 10 miles? Tell where these places are.

3. How long does it take you to walk a mile? If you walk 3 miles in an hour, how far can you walk in 2 hours? in 3 hours?

Long distances, such as between cities, are measured in miles.

4. If you walk 6 miles in 2 hours, how far do you walk in 1 hour?

5. If an automobile goes 45 miles in 3 hours, how far does it go in 1 hour? in 2 hours?

6. If a train goes from New York to Boston, a distance of 240 miles, in 5 hours, how far does it go in 1 hour? How do you find out? 48

7. A steamer goes from Chicago to Milwaukee, a distance of 85 miles, in 5 hours. How many miles per hour does it run? How do you find out? 17

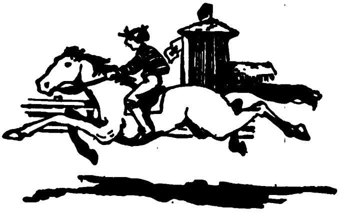
8. A train goes from Albany to New York in 3 hours. How many miles per hour does it run, if the distance is 144 miles? How do you find out? 48

9. A train goes from San Francisco to Seattle in 32 hours. How many miles per hour does it run if the distance is 960 miles? How do you find out? 30

10. If you know a distance in miles, and the number of hours required to go that distance, try to give a rule for finding the speed in miles per hour. The preceding problems should help you to find the rule.

See page 364.

WRITTEN EXERCISES



1. If a running horse goes one mile (5280 feet) in one minute and 36 seconds, how many feet per second does he go? (Suggestion: How many seconds are there in 1 minute and 36 seconds?) **55**

2. A man traveled 1056 miles on a motor cycle, the actual time used in traveling being 32 hours. How many miles an hour did he go? **33**

3. A man drove an automobile from New York to Boston, a distance of 270 miles, in 15 hours. What was the average speed? **18**

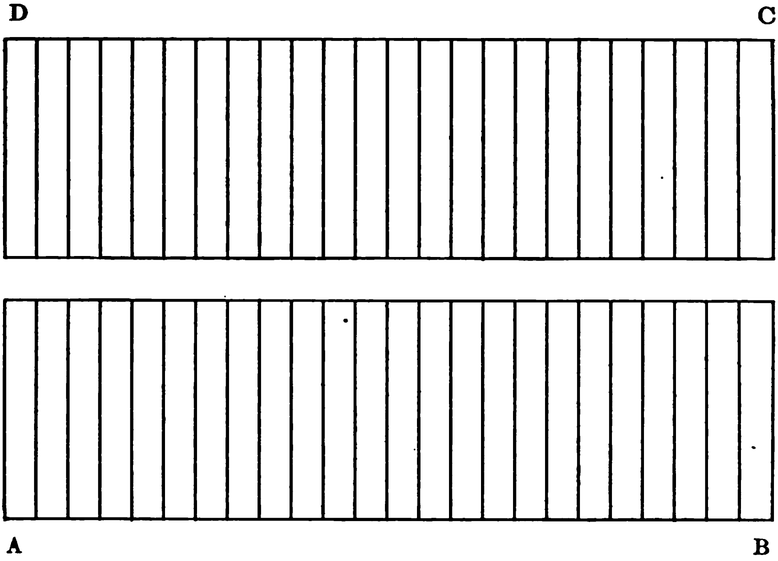
4. A fast ocean steamer sailed 648 nautical miles in 24 hours. What was its average speed per hour? **27**

5. On its trial trip a cruiser sailed 1363 nautical miles in 47 hours. What was its average speed per hour? **29**

6. A fast freight goes from Chicago to New York in 34 hours. What is the average speed per hour if the distance is 918 miles? **27**

Drill in Fundamentals. Play the game on page 91, using examples in long division.

See page 364.



This diagram represents a city block laid out into building lots. The lots are 25 feet wide and 175 feet deep. The alley is 30 feet wide.

WRITTEN EXERCISES

1. How long is this block from A to B? **600 ft.**

2. How wide is this block from B to C? **380 ft.**

3. If this block is covered completely with flat buildings 3 stories high (3 flats on each lot), how many flats are there in the whole block? **144**

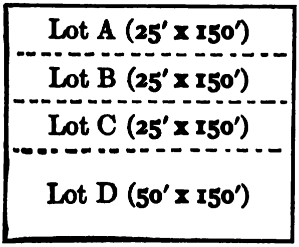
4. If on an average four people live in each flat, how many people live in this block? **576**

5. If you live in a city or town try to find how large the lots are and how many of them there are in a block. Estimate how many people live in a block in your town.

See page 364.

WRITTEN EXERCISES

1. In this figure one inch represents 100 feet. Find the dimensions of each of the four lots. Write down these dimensions for use in the problems on this page.



2. How many square feet are there in each of the lots, A, B, C? 3750

3. How many square feet are there in the lot D? 7500

Lots are frequently sold at so much per front-foot. That is, if a lot is 25 feet wide along the street, then at $100 a front-foot, it would cost 25×$100, or $2500.

4. A real-estate man bought these four lots at $85 a front-foot. How much did they cost him? $10,625

5. He sold lot A (corner lot) for $3000. How much was that per front-foot? $120.00

6. He sold lots B and C for $2750 and $2625 respectively. How much was that per front-foot for each lot? $110.00; $105.00

7. He sold Lot D for $3750. How much was that per front-foot? $75.00

8. How much did the real-estate man get for all four lots? Did he gain or lose on the whole transaction, and how much? $12,125; $1500 gain

The most valuable land in great cities is often sold by the square foot, while the less valuable land in smaller cities is usually sold at so much a lot.

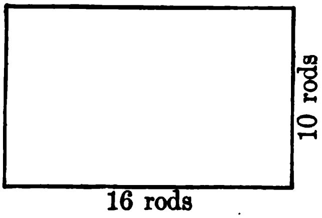
9. Find how lots are sold in your city, and make problems on buying and selling lots.

See page 364.

In measuring pieces of land, such as farms, the rod and the acre are used as units of measure.

There are 320 rods in one mile. One rod is 16½ feet, or 5½ yards.

A piece of land 16 rods long and 10 rods wide makes one acre.



12 inches = 1 foot
3 feet = 1 yard
5280 feet = 1 mile
320 rods = 1 mile
16½ feet = 1 rod
5½ yards = 1 rod
1760 yards = 1 mile
160 square rods = 1 acre
640 acres = 1 square mile

ORAL AND WRITTEN EXERCISES

1. How many square rods are there in one acre?

2. How many acres are there in a field 80 rods long and 40 rods wide? 20

Suggestion. First find the number of square rods in the field, and then divide by 160.

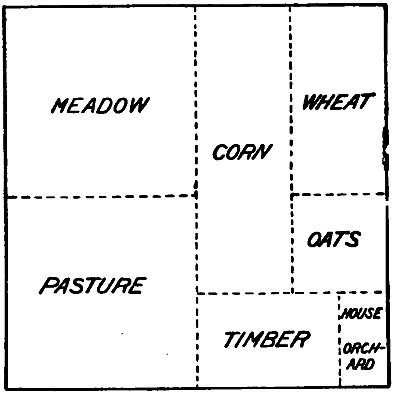
3. How many acres are there in a field 160 rods long and 80 rods wide? 80

4. How many acres are there in a field 120 rods long and 60 rods wide? 45

5. How many square rods are there in a square mile? 102,400

Drill in Fundamentals. Play game on page 91, using examples in long division.

See page 365.



WRITTEN EXERCISES

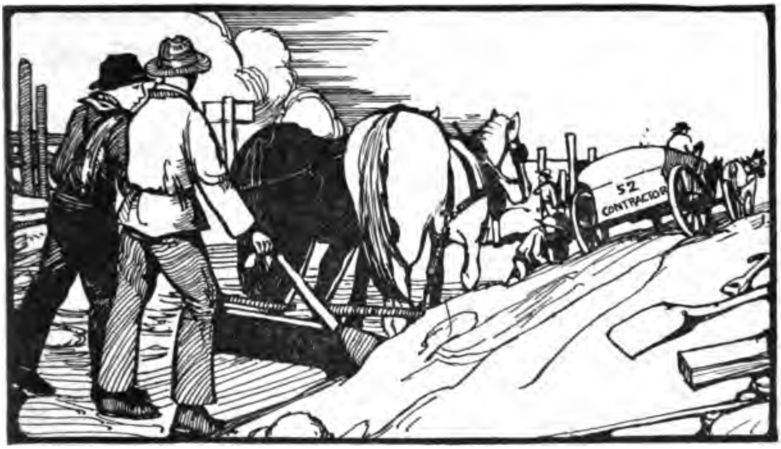
1. This figure represents a farm 160 rods wide and 160 rods long. How many acres are there in this farm? 160
2. How many rods are represented by one inch in the drawing? 80
3. How wide and how long is the timber lot? How many acres are there in it? 40 rds. by 60 rds.; 15 acres
4. How many acres are there in wheat? in oats? 20; 10
5. How many acres are used for pasture? 40
6. How many acres are in corn? in meadow? How many acres are used for the buildings and orchard? 30; 40; 5
7. Draw a figure representing a field 80 rods long and 40 rods wide, letting one inch represent 20 rods. How many acres are there in this field?
8. Draw a diagram of 1 square mile, letting 8 inches represent one mile. Divide it into several farms and state how large each farm is.

See page 365.

ORAL EXERCISES

1. How can you find the number of square feet in a rectangle?
2. How can you find the number of square yards in a rectangle?
3. How can you find the number of square inches in the top of your desk?
4. If you know the year in which a man was born and the year in which he died, how can you tell his age at the time of his death?
5. If you know the year in which your father was born, how can you tell his age at present?
6. If you know your father's age, how can you tell the year in which he was born?
7. If you know a man's salary and how much he spends, how can you tell how much he saves?
8. If you know how fast a train runs and the number of hours it runs, how can you tell how far it goes?
9. If you know the distance a train has gone and the number of hours it took to go that distance, how do you find its average speed?
10. If you know the speed of a train, how do you find how long it will take to go a certain distance?
11. If you know a distance in feet, and the number of seconds required to go that distance, how do you find the speed? How will this speed be given?
12. If you know the number of acres a farmer plows, and the number of days it takes to plow them, how can you tell how many acres he plows in a day?

See page 365.



The dirt taken out in digging a basement is measured by the *cubic yard.* If you dig a hole 1 yard long, 1 yard wide and 1 yard deep, you take out one cubic yard of dirt. A cubic yard of earth is frequently called a *load.*

ORAL EXERCISES

1. If you dig a hole 2 yards long, 1 yard wide, and 1 yard deep, how many cubic yards of earth do you take out?

2. How many cubic yards are dug out of a hole 2 yards wide, 3 yards long, and 1 yard deep? How many cubic yards are dug out if the hole is 2 yards deep?

3. How many cubic yards are removed in digging a basement 12 yards long, 10 yards wide, and 2 yards deep? How do you find out?

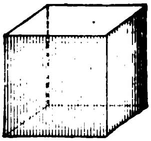
4. How many cubic yards are removed from a cellar 24 feet (8 yards) long, 18 feet (6 yards) wide, and 6 feet (2 yards) deep?

See page 366.

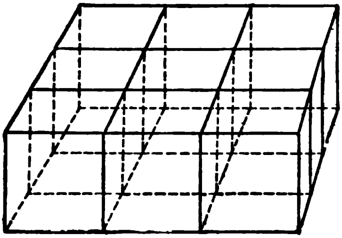
If you dig a square hole one foot on each side and one foot deep, one *cubic foot* of earth has been removed.

ORAL EXERCISES

1. How many square feet are there in one square yard?

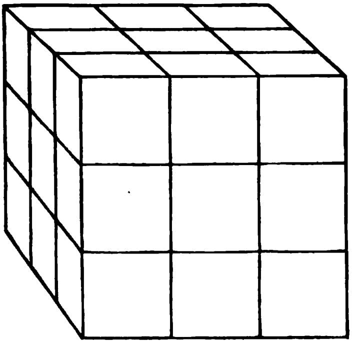


2. How many cubic feet of earth are removed in digging a hole one yard square and one foot deep?



3. How many cubic feet are removed in digging a hole 3 feet long, 3 feet wide and 3 feet deep?

4. How many cubic feet are there in one cubic yard?



WRITTEN EXERCISES

1. How many cubic feet must be removed in digging a basement 25 feet wide, 35 feet long and 7 feet deep? How many cubic yards?

Solution: Multiply 35 by 25 and this product by 7 to get the number of cubic feet. Then divide the number of cubic feet by 27 to get the number of cubic yards. Why?

That is, $7 \times 25 \times 35 = 6125$, $6125 \div 27 = 226$, with a remainder 23. Hence, in round numbers, the number of cubic yards is 227.

2. In this way find the number of cubic yards in an excavation 17 feet wide, 28 feet long, and 5 feet deep.

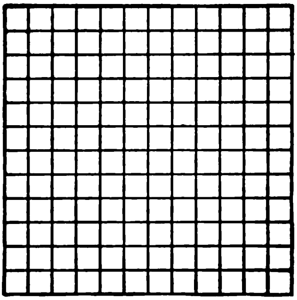
page 366.

ORAL AND WRITTEN EXERCISES

1. Measure the length, width, and height of your schoolroom. Find each dimension to the nearest foot.

2. How many cubic feet of air does your schoolroom hold?

3. If there are 24 persons in this schoolroom, how many cubic feet of air does the room hold for each person?

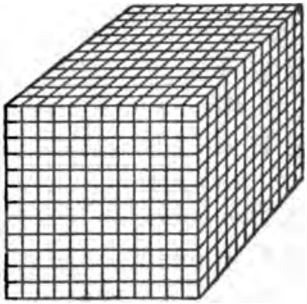


4. On the board draw a square foot and divide it into square inches.

5. How many square inches are there in one square foot?

6. How many inch cubes can be placed in one layer on one square foot? **144**

7. How many inch cubes are there in 2 such layers? 3 layers? 4 layers? 12 layers? **288; 432; 576; 1728**



8. How many inch cubes make one cubic foot? **1728**

9. When you know how many yards long, wide, and deep an excavation is, how do you find how many cubic yards there are in it?

10. When you know how many feet long, wide, and high a schoolroom is, how do you find how many cubic feet of air it contains?

11. When you know how many inches long, wide, and deep a box is, how do you find how many inch cubes the box will hold? **See page 366.**

What are the people in the picture doing? What is the ice to be used for? The ice is kept until it is needed by piling it closely in great ice-houses and packing sawdust around it to keep it from thawing. It is hauled to the cities in cars, or floated in barges along canals and rivers.

ORAL AND WRITTEN EXERCISES

1. How many cubic feet of ice are there in a piece 1 foot thick and 1 yard square?
2. How many square yards of ice 1 foot thick must be cut to make one cubic yard? **3**

One cubic foot of ice weighs about 58 pounds.

3. **How many pounds does one cubic yard of ice weigh? 1566**
4. **How much does the weight of 35 cubic feet of ice differ from 2000 pounds, or one ton? 30 lbs. more**

It is usual to allow 40 cubic feet of ice to the ton to allow for waste and looseness of packing.

5. **How many tons of ice are there in a pile containing 24360 cubic feet? 609**

See page 366.

WRITTEN EXERCISES

1. A railway car is 37 feet long and 8 feet wide, inside measure. How many cubic feet of ice does it hold if the ice is piled 5 feet deep? How many tons of ice are there in this car if we count 40 cubic feet to the ton? **1480 cu. ft.; 37 tons**

One ton = 2000 pounds.

2. If a city dealer sells ice at 35 cents per hundred pounds, how much does he get for one ton of ice, allowing 200 pounds for waste? **$6.30**
3. A family takes a 10-cent piece of ice each day. How much is their ice bill for the month of September? **$3.00**
4. At an average of 20 pounds of ice to a family, how many families can be served from one ton of ice, allowing 300 pounds for waste? **85**

5. An ice wagon starts out on a very warm day with 3 tons of ice. How many pounds of ice are sold if we allow 1200 pounds for waste? **4800**
6. How many families at 40 pounds each can be served from a load of 3 tons, allowing 800 pounds for waste? **130**
7. In a western town a family uses 6000 pounds of ice in a year. How many times does this fill an ice-box which holds 75 pounds? **80**

Drill in Fundamentals. Play the game on page 91, using examples in long division.

See page 366.

To estimate the quotient figures when the divisor is a three-figure number *take quotient of hundreds.*

Example 1. Divide 1987 by 416.

$$\begin{array}{r} 4 \\ 416\overline{)1987} \\ \underline{1664} \\ 323 \end{array}$$

Since $19 \div 4 = 4$ with a remainder, we try 4 as the quotient. On multiplying this proves correct.

Use this method when the second figure of the divisor is small.

Sometimes this method gives a quotient figure which is too large, as in $6518 \div 834$, when the quotient figure apparently is 8, while the real quotient is 7.

Example 2. Divide 4486 by 684.

$$\begin{array}{r} 6 \\ 684\overline{)4486} \\ \underline{4104} \\ 382 \end{array}$$

Since 684 is nearer 700 than 600, and since $44 \div 7 = 6$ with a remainder, we try 6 as the quotient figure. On multiplying this proves correct.

Use this method when the second figure of the divisor is larger.

Sometimes this method gives a quotient figure which is too small, as in $4426 \div 486$, when the figure apparently is 8, while in reality it is 9.

Great care should be taken to make the first estimate correct, since that saves much time.

ORAL AND WRITTEN EXERCISES

Estimate all the quotients below. Then test to see how many of your estimates are correct.

1. $394\overline{)1789}$(4-)
2. $412\overline{)3846}$(9-)
3. $692\overline{)4597}$(6-)
4. $882\overline{)7400}$(8-)
5. $621\overline{)4700}$(7-)
6. $295\overline{)1470}$(4-)
7. $817\overline{)7864}$(9-)
8. $687\overline{)5938}$(8-)
9. $381\overline{)2816}$(7-)
10. $924\overline{)7140}$(7-)
11. $293\overline{)2486}$(8-)
12. $426\overline{)3794}$(8-)
13. $578\overline{)5378}$(9-)
14. $842\overline{)6589}$(7-)
15. $917\overline{)1648}$(8-)

See page 367.

Example 1. Divide 98964 by 314.

$$\begin{array}{r} 315\\ 314\overline{)98964}\\ \underline{942}\\ 476\\ \underline{314}\\ 1624\\ \underline{1570}\\ 54\end{array}$$

Hundreds: 989 ÷ 314 = 3 with a remainder. Write *3* in the quotient.

Tens: 476 ÷ 314 = 1 with a remainder. Write *1* in the quotient.

Ones: 1624 ÷ 314 = 5 with a remainder. Write *5* in the quotient.

The quotient is 315, remainder 54.

Example 2. Divide 397864 by 17900.

$$\begin{array}{r} 22\\ 179\cancel{0}\cancel{0}\overline{)3978\cancel{6}\cancel{4}}\\ \underline{358}\\ 398\\ \underline{358}\\ \{4064\end{array}$$

Cancel as shown in example, then divide as usual. Annex to the remainder the figures cancelled in the dividend.

The quotient is 22, remainder 4064.

Divide:

WRITTEN EXERCISES

1. $\overset{354\text{-}178}{498\overline{)176470}}$
2. $\overset{301\text{-}210}{347\overline{)104657}}$
3. $\overset{2031\text{-}61}{435\overline{)883546}}$
4. $\overset{2406\text{-}83}{354\overline{)851807}}$
5. $\overset{123\text{-}477}{512\overline{)63453}}$
6. $\overset{217\text{-}276}{296\overline{)64508}}$
7. $\overset{506\text{-}117}{218\overline{)110425}}$
8. $\overset{304\text{-}423}{709\overline{)215959}}$
9. $\overset{202\text{-}470}{632\overline{)128134}}$
10. $\overset{279\text{-}26}{489\overline{)136457}}$
11. $\overset{407\text{-}508}{823\overline{)335469}}$
12. $\overset{289\text{-}147}{165\overline{)47832}}$
13. $\overset{392\text{-}4}{813\overline{)318700}}$
14. $\overset{327\text{-}395}{593\overline{)194306}}$
15. $\overset{79\text{-}3939}{4070\overline{)325469}}$
16. $\overset{2838\text{-}235}{385\overline{)1092865}}$
17. $\overset{212\text{-}49}{692\overline{)146753}}$
18. $\overset{41\text{-}2215}{5070\overline{)210085}}$
19. $\overset{640\text{-}99}{374\overline{)239459}}$
20. $\overset{51\text{-}874}{7130\overline{)364504}}$
21. $\overset{308\text{-}127}{295\overline{)90987}}$
22. $\overset{21\text{-}1118}{7120\overline{)150638}}$
23. $\overset{194\text{-}4180}{5640\overline{)1098340}}$
24. $\overset{508\text{-}104}{624\overline{)317096}}$
25. $\overset{27\text{-}6800}{31200\overline{)849200}}$
26. $\overset{67\text{-}1544}{2640\overline{)178424}}$
27. $\overset{75\text{-}2288}{3790\overline{)286538}}$

See page 367.

One of the most important things we have to do is to keep in good health. Sometimes it is not so easy to tell whether we are in really good health or not. One of the ways a child can tell is by seeing whether he weighs as much as he should. The tables on the opposite page will help you to do this.

If you are a boy, and between 8 and 9 years old, this table shows that you are likely to be between 42 and 54 inches tall. If you are 8 years old, and 50 inches tall, the table says you should weigh about 59 pounds. If you are 9 years old, and 50 inches tall, the table says you should weigh about 60 pounds.

If you are a girl 9 years old and 49 inches tall you should weigh about 56 pounds.

The teacher will help you to read this table if it causes you trouble. It is important to learn to understand such tables because much valuable information is put into the form of tables.

ORAL EXERCISES

1. What should be your weight according to the table on page 255?
2. Find in this table what should be the weight of a boy 8 years old and 48 inches tall.
3. What should be the weight of a girl 9 years old and 52 inches tall?
4. According to this table, how much should you be gaining each month? How many pounds a year is this?
5. According to this table what should be the total gain in weight of a girl from the time she is 8 years old until she is 11? of a boy?

See page 367.

The table given below was prepared by Dr. Thomas D. Wood for the Child Health Organization of New York, and is used here by their permission. Weights and measures should be taken without shoes and in only the usual indoor clothes. Boys should remove their coats.

Right Height and Weight for Boys

Height, inches	5 yrs.	6 yrs.	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs.
39	35	36	37	..	..	..	..
40	37	38	39	..	..	..	..
41	39	40	41	..	..	..	..
42	41	42	43	44	..	..	..
43	43	44	45	46	..	..	..
44	45	46	46	47	..	..	..
45	47	47	48	48	49	..	..
46	48	49	50	50	51	..	..
47	..	51	52	52	53	54	..
48	..	53	53	54	55	56	57
49	..	55	56	57	58	58	59
50	..	..	58	59	60	60	61
51	..	..	60	61	62	63	64
52	..	..	62	63	64	65	67
53	..	..	..	66	67	68	69
54	..	..	..	69	70	71	72
55	..	..	..	..	73	74	75
56	..	..	..	..	77	78	79
57	..	..	..	..	..	81	82
58	..	..	..	..	..	84	85

Right Height and Weight for Girls

Height, inches	5 yrs.	6 yrs.	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs.
39	34	35	36	..	..	..	..
40	36	37	38	..	..	..	..
41	38	39	40	..	..	..	..
42	40	41	42	43	..	..	..
43	42	42	43	44	..	..	..
44	44	45	45	46	..	..	..
45	46	47	47	48	49	..	..
46	48	48	49	50	51	..	..
47	..	49	50	51	52	53	..
48	..	51	52	53	54	55	..
49	..	53	54	55	56	57	58
50	..	..	56	58	59	60	61
51	..	..	59	60	61	62	63
52	..	..	62	63	64	65	66
53	..	..	..	66	67	68	68
54	..	..	..	68	69	70	71
55	..	..	..	..	72	73	74
56	..	..	..	..	76	77	78
57	..	..	..	..	..	81	82
58	..	..	..	..	..	85	86
59	..	..	..	..	..	89	90

About What a Boy Should Gain Each Month

Age	
5 to 8	6 oz.
8 to 12	8 oz.
12 to 16	16 oz.
16 to 18	8 oz.

About What a Girl Should Gain Each Month

Age	
5 to 8	6 oz.
8 to 11	8 oz.
11 to 14	12 oz.
14 to 16	8 oz.
16 to 18	4 oz.

See page 367.

Perform each of the multiplications indicated. Check your results by multiplying the lower by the upper number.

1. 819
746
610974

2. 827
509
420943

3. 921
468
431028

4. 983
640
629120

5. 789
605
477345

6. 687
493
338691

7. 749
568
425432

8. 890
569
506410

9. 538
691
371758

10. 769
835
642115

11. 978
643
628854

12. 789
590
465510

13. 409
821
335789

14. 857
746
639322

15. 794
683
542302

16. 698
570
397860

17. 597
409
244173

18. 804
260
209040

19. 934
876
818184

20. 519
872
452568

Perform the divisions indicated below. Check each one.

1502-72
21. 346)519764

1537-175
22. 478)734861

1185-181
23. 659)781096

4113-87
24. 354)1456089

4834-301
25. 640)3094061

1611-97
26. 418)673495

1291-324
27. 573)740067

1139-464
28. 705)803459

3433-292
29. 436)1497080

3708-703
30. 783)2904067

1278-73
31. 572)731089

1171-92
32. 684)801056

1170-777
33. 784)918057

4502-290
34. 513)2309816

7640-601
35. 697)5325681

Drill in Fundamentals. Run a cross-country race as described on page 91, using examples in multiplication.

The next day run such a race, using long division.

See page 367.

ORAL AND WRITTEN EXERCISES

1. How many seconds are there in one minute? in one hour? **60; 3600 sec.**

2. How many minutes are there in one hour? in a day of 24 hours? **60; 1440 min.**

3. If a man works 8 hours a day, how many hours does he work in one year of 300 working days? **2400 hrs.**

4. If a man works 10 hours a day, how many more hours does he work in a year of 300 working days than a man who works 8 hours a day? **600 hrs.**

5. If a school is in session from 9 o'clock to 12, and from 1.30 to 3.30, how many hours is this school in session each day? **5 hrs.**

6. A school is in session 5 hours each day for 190 days. How many hours is this? **950 hrs.**

7. If a half-hour is given each day to arithmetic, how many hours are given to arithmetic in 190 days? **95 hrs.**

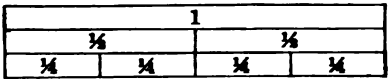
8. A clock strikes once at 1 o'clock, twice at 2, and so on. How many times does it strike from 1 o'clock to 12 o'clock, not counting the half-hour strokes? How many times does this clock strike in a day of 24 hours? **78 times; 156 times**

9. How many half-hour strokes does a clock strike in one day of 24 hours? How many strokes does a clock strike in 24 hours, counting the half-hour strokes? **24 strokes; 180 strokes**

10. How many times does a clock strike in one year of 365 days, if it strikes 156 times each day? **56,940 times**

11. How many times does a clock strike in a year of 365 days if it strikes 180 times each day? **65,700 times**

See page 367.



ORAL EXERCISES

1. How many halves are there in 1? How many 4ths are there in 1?

2. How many 4ths are there in $\frac{1}{2}$?

We write this $\frac{1}{2}=\frac{2}{4}$.

3. Draw a figure to show how many 8ths there are in 1.

4. Draw a figure to show how many 8ths there are in $\frac{1}{4}$.

We write this $\frac{1}{4}=\frac{2}{8}$.

5. In a fraction what is the number above the line called? What is the number below the line called? What is the numerator and what is the denominator of $\frac{2}{4}$?

In the fraction $\frac{2}{4}$ the 4 tells into how many parts the figure has been divided, and the 2 tells how many of these parts are taken.

6. Tell a similar story for each of the fractions $\frac{1}{2}$, $\frac{3}{6}$, $\frac{4}{8}$.

In examples 2 and 4 above we see that if the denominator of one of the fractions $\frac{1}{2}$, $\frac{1}{4}$ is doubled the numerator must also be doubled if the value of the fraction is to remain the same. This is true for all fractions.

7. Read the following and supply the missing numbers:

$\frac{1}{3}=?/6$ $\frac{1}{6}=?/12$ $\frac{3}{5}=?/10$ $\frac{1}{5}=?/10$

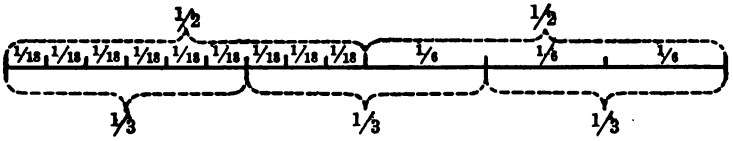
$\frac{1}{2}=?/4$ $\frac{2}{3}=?/6$ $\frac{1}{7}=?/14$ $\frac{4}{5}=?/10$

$\frac{2}{5}=?/10$ $\frac{3}{4}=?/8$ $\frac{1}{4}=?/8$ $\frac{2}{7}=?/14$

See page 368.

ORAL EXERCISES

1. In the figure point out $\frac{1}{2}$ of the whole line. How many 6ths are there in $\frac{1}{2}$?



$\frac{1}{2}=\frac{3}{6}=\frac{9}{18}$ $\frac{1}{6}=\frac{3}{18}$

2. In the figure point out $\frac{1}{18}$ of the whole line. How many 18ths are there in $\frac{1}{2}$?

In the above examples we see that if the denominator of one of the fractions $\frac{1}{2}$, $\frac{1}{6}$, $\frac{3}{6}$ is multiplied by 3, the numerator must also be multiplied by 3 if the value of the fraction is to remain unchanged. This is true for all fractions.

3. Change $\frac{1}{3}$ into two different fractions. Draw a figure for each change.

4. Change $\frac{2}{3}$ into two different fractions. Can you change $\frac{2}{3}$ into 12ths?

5. Change $\frac{1}{5}$ into two different fractions. Can you change $\frac{1}{5}$ into 10ths? into 12ths?

6. Draw a figure to show that $\frac{1}{2}=\frac{4}{8}$.

7. Draw a figure to show that $\frac{1}{3}=\frac{4}{12}$.

8. Draw a figure to show how many 12ths there are in $\frac{1}{3}$.

The following is true for all fractions: If the denominator of a fraction is multiplied by 4, the numerator must also be multiplied by 4 to keep the value of the fraction unchanged.

9. Change each of the following into three different fractions: $\frac{2}{3}$, $\frac{4}{5}$, $\frac{5}{6}$, $\frac{5}{8}$.

See page 368.

The Terms of a Fraction. The numerator and the denominator of a fraction are called the *terms* of the fraction.

We have seen on the preceding pages that both terms of a fraction may be multiplied by 2, 3 or 4, without changing the value of the fraction.

If both terms of a fraction may be multiplied by 2, it follows that they may also be divided by 2. Thus, 2/4 = 1/2, because 1/2 = 2/4. Similarly, 4/8 = 2/4 = 1/2, 6/8 = 3/4, and 4/6 = 2/3.

Fractions in the Simplest Form. If both terms of a fraction cannot be divided without a remainder by the same whole number, except 1, then the fraction is said to be in the *simplest form*. Thus, 1/2, 2/3 and 3/4 are in the simplest form, while 2/4 and 3/9 are not in the simplest form.

ORAL EXERCISES

1. In which of the fractions can both terms be divided exactly by 2: 1/2, 1/4, 2/4, 3/5, 4/10, 4/6, 6/10, 6/7, 6/8, 2/12?
2. Which of the fractions in Example 1 are in the simplest form? Reduce the others to the simplest form by dividing both terms by 2.

From 1/2 = 3/6, it follows that 3/6 = 1/2.

3. In 3/6 = 1/2, both terms of the fraction 3/6 have been divided by what number?
4. In which of the following fractions may both terms be divided by 3: 2/5, 3/6, 5/9, 6/9, 3/9, 3/15, 3/16, 6/15?

Which fractions in this list are in the simplest form? Reduce the others to the simplest form.

5. Which fractions in the following list are in the simplest form: 3/8, 3/6, 2/6, 5/6, 3/9, 4/10, 3/12, 4/12, 4/8. Reduce the others to the simplest form.

See page 368.

Example 1. Divide 49 by 8. This gives a quotient 6 and a remainder 1. The remainder is a part of the dividend which has not yet been divided. If 1 is divided by 8, we get $\frac{1}{8}$, as there are eight $\frac{1}{8}$'s in 1.

Hence, we write $49 \div 8 = 6\frac{1}{8}$, with no remainder.

Example 2. Divide 129 by 6. The quotient is 21, and the remainder is 3. The remainder divided by 6 gives $\frac{3}{6}$, or $\frac{1}{2}$. Hence, the quotient is $21\frac{1}{2}$.

$$\begin{array}{l} \;\;21\frac{3}{6}, \text{ or } 21\frac{1}{2} \\ 6\overline{)129} \end{array}$$

Notice that $\frac{3}{6}$ is reduced to the simplest form by dividing both terms by 3.

WRITTEN EXERCISES

In this manner divide each of the following. Express each fraction in the simplest form. Thus, if you get $\frac{3}{6}$ write it $\frac{1}{2}$, if you get $\frac{6}{8}$ write it $\frac{3}{4}$, and so on:

1. $487 \div 5$ ($97\frac{2}{5}$) $573 \div 6$ ($95\frac{1}{2}$) $654 \div 7$ ($93\frac{3}{7}$) $845 \div 8$ ($105\frac{5}{8}$)
2. $749 \div 6$ ($124\frac{5}{6}$) $695 \div 7$ ($99\frac{2}{7}$) $819 \div 9$ (91) $763 \div 9$ ($84\frac{7}{9}$)
3. $729 \div 8$ ($91\frac{1}{8}$) $798 \div 2$ (399) $689 \div 7$ ($98\frac{3}{7}$) $879 \div 2$ ($439\frac{1}{2}$)
4. $827 \div 7$ ($118\frac{1}{7}$) $631 \div 5$ ($126\frac{1}{5}$) $492 \div 6$ (82) $746 \div 3$ ($248\frac{2}{3}$)
5. $827 \div 3$ ($275\frac{2}{3}$) $742 \div 4$ ($185\frac{1}{2}$) $873 \div 5$ ($174\frac{3}{5}$) $932 \div 7$ ($133\frac{1}{7}$)
6. $596 \div 5$ ($119\frac{1}{5}$) $985 \div 9$ ($109\frac{4}{9}$) $586 \div 6$ ($97\frac{2}{3}$) $791 \div 8$ ($98\frac{7}{8}$)
7. $749 \div 7$ (107) $915 \div 8$ ($114\frac{3}{8}$) $573 \div 7$ ($81\frac{6}{7}$) $817 \div 8$ ($102\frac{1}{8}$)
8. $693 \div 8$ ($86\frac{5}{8}$) $798 \div 9$ ($88\frac{2}{3}$) $897 \div 9$ ($99\frac{2}{3}$) $689 \div 7$ ($98\frac{3}{7}$)
9. $395 \div 9$ ($43\frac{8}{9}$) $897 \div 7$ ($128\frac{1}{7}$) $794 \div 8$ ($99\frac{1}{4}$) $647 \div 8$ ($80\frac{7}{8}$)
10. $539 \div 6$ ($89\frac{5}{6}$) $697 \div 6$ ($116\frac{1}{6}$) $987 \div 5$ ($197\frac{2}{5}$) $951 \div 9$ ($105\frac{2}{3}$)
11. $847 \div 7$ (121) $276 \div 4$ (69) $374 \div 5$ ($74\frac{4}{5}$) $487 \div 7$ ($69\frac{4}{7}$)
12. $519 \div 8$ ($64\frac{7}{8}$) $941 \div 6$ ($156\frac{5}{6}$) $212 \div 7$ ($30\frac{2}{7}$) $692 \div 8$ ($86\frac{1}{2}$)

Drill in Fundamentals. Play game on page 91, using examples in long division.

See page 368.

ORAL EXERCISES

Give the sums of the following:

1. $\frac{1}{3}+\frac{1}{3}$ 4. $\frac{1}{5}+\frac{3}{5}$ 7. $\frac{1}{8}+\frac{5}{8}$ 10. $\frac{1}{6}+\frac{5}{6}$

2. $\frac{1}{4}+\frac{1}{4}$ 5. $\frac{2}{5}+\frac{2}{5}$ 8. $\frac{3}{8}+\frac{5}{8}$ 11. $\frac{1}{7}+\frac{2}{7}$

3. $\frac{1}{5}+\frac{2}{5}$ 6. $\frac{1}{8}+\frac{3}{8}$ 9. $\frac{1}{8}+\frac{7}{8}$ 12. $\frac{3}{7}+\frac{2}{7}$

Example 1. Add $\frac{1}{2}$ and $\frac{1}{4}$.

$\frac{1}{2}=\frac{2}{4}$ We must first change $\frac{1}{2}$ into 4ths. That is, $\frac{1}{2}+\frac{1}{4}$
$\frac{1}{4}=\underline{\frac{1}{4}}$ $=\frac{2}{4}+\frac{1}{4}=\frac{3}{4}$.
$\frac{3}{4}$, sum.

WRITTEN EXERCISES

In this way add the following:

1. $\frac{1}{3}+\frac{1}{6}$ ($\frac{1}{2}$) 4. $\frac{1}{4}+\frac{1}{8}$ ($\frac{3}{8}$) 7. $\frac{1}{2}+\frac{1}{6}$ ($\frac{2}{3}$) 10. $\frac{1}{3}+\frac{4}{9}$ ($\frac{7}{9}$)

2. $\frac{1}{2}+\frac{1}{8}$ ($\frac{5}{8}$) 5. $\frac{1}{4}+\frac{3}{8}$ ($\frac{5}{8}$) 8. $\frac{1}{3}+\frac{1}{9}$ ($\frac{4}{9}$) 11. $\frac{1}{8}+\frac{1}{16}$ ($\frac{3}{16}$)

3. $\frac{1}{2}+\frac{3}{8}$ ($\frac{7}{8}$) 6. $\frac{1}{4}+\frac{5}{8}$ ($\frac{7}{8}$) 9. $\frac{2}{3}+\frac{1}{9}$ ($\frac{7}{9}$) 12. $\frac{3}{8}+\frac{3}{16}$ ($\frac{9}{16}$)

Example 2. Subtract $\frac{1}{6}$ from $\frac{1}{2}$.

$\frac{1}{2}=\frac{3}{6}$ We must first change $\frac{1}{2}$ to 6ths. That is, $\frac{1}{2}-\frac{1}{6}=$
$\frac{1}{6}=\underline{\frac{1}{6}}$ $\frac{3}{6}-\frac{1}{6}=\frac{2}{6}=\frac{1}{3}$.
$\frac{2}{6}=\frac{1}{3}$, remainder.

ORAL AND WRITTEN EXERCISES

In this manner find the differences in the following. See how many you can solve without using pencil and paper:

1. $\frac{1}{2}-\frac{1}{4}$ ($\frac{1}{4}$) 7. $\frac{1}{2}-\frac{1}{6}$ ($\frac{1}{3}$) 13. $\frac{1}{3}-\frac{2}{9}$ ($\frac{1}{9}$) 19. $\frac{1}{4}-\frac{1}{16}$ ($\frac{3}{16}$)

2. $\frac{3}{4}-\frac{1}{2}$ ($\frac{1}{4}$) 8. $\frac{1}{2}-\frac{1}{8}$ ($\frac{3}{8}$) 14. $\frac{4}{9}-\frac{1}{3}$ ($\frac{1}{9}$) 20. $\frac{3}{4}-\frac{3}{8}$ ($\frac{3}{8}$)

3. $\frac{3}{8}-\frac{1}{4}$ ($\frac{1}{8}$) 9. $\frac{3}{4}-\frac{1}{8}$ ($\frac{5}{8}$) 15. $\frac{5}{9}-\frac{1}{3}$ ($\frac{2}{9}$) 21. $\frac{3}{4}-\frac{5}{8}$ ($\frac{1}{8}$)

4. $\frac{5}{8}-\frac{1}{4}$ ($\frac{3}{8}$) 10. $\frac{1}{3}-\frac{1}{9}$ ($\frac{2}{9}$) 16. $\frac{1}{6}-\frac{1}{12}$ ($\frac{1}{12}$) 22. $\frac{3}{4}-\frac{3}{16}$ ($\frac{9}{16}$)

5. $\frac{5}{8}-\frac{1}{2}$ ($\frac{1}{8}$) 11. $\frac{2}{3}-\frac{4}{9}$ ($\frac{2}{9}$) 17. $\frac{1}{5}-\frac{1}{10}$ ($\frac{1}{10}$) 23. $\frac{3}{4}-\frac{7}{16}$ ($\frac{5}{16}$)

6. $\frac{7}{8}-\frac{3}{4}$ ($\frac{1}{8}$) 12. $\frac{1}{4}-\frac{1}{16}$ ($\frac{3}{16}$) 18. $\frac{1}{4}-\frac{3}{16}$ ($\frac{1}{16}$) 24. $\frac{3}{4}-\frac{9}{16}$ ($\frac{3}{16}$)

See page 369.

Since $\frac{1}{5}+\frac{1}{5}=\frac{2}{5}$, we know that $2\times\frac{1}{5}=\frac{2}{5}$.

Also, since $\frac{2}{7}+\frac{2}{7}=\frac{4}{7}$, we know that $2\times\frac{2}{7}=\frac{4}{7}$.

That is, to multiply $\frac{1}{5}$ or $\frac{2}{7}$ by 2, multiply the numerator by 2 and leave the denominator unchanged.

ORAL EXERCISES

Give products in the following:

1. $2\times\frac{3}{7}$ 4. $3\times\frac{1}{8}$ 7. $5\times\frac{1}{8}$ 10. $4\times\frac{1}{9}$
2. $2\times\frac{2}{5}$ 5. $3\times\frac{3}{16}$ 8. $5\times\frac{1}{16}$ 11. $4\times\frac{2}{9}$
3. $3\times\frac{1}{4}$ 6. $3\times\frac{5}{16}$ 9. $5\times\frac{3}{16}$ 12. $7\times\frac{1}{16}$

From these examples we get the rule:

> *To multiply a fraction by a whole number, multiply the numerator by the whole number and leave the denominator unchanged.*

Fractions found in this way may need to be made simpler by the method shown on page 260. This is shown in the following example:

Example. Multiply $\frac{3}{16}$ by 4.

$4\times\frac{3}{16}=\frac{12}{16}=\frac{3}{4}$. In this case both terms of the fraction $\frac{12}{16}$ are divided by 4.

WRITTEN EXERCISES

Multiply and reduce each result to the simplest form.

1. $3\times\frac{2}{9}$ ($\frac{2}{3}$) 4. $4\times\frac{1}{10}$ ($\frac{2}{5}$) 7. $4\times\frac{5}{32}$ ($\frac{5}{8}$) 10. $8\times\frac{3}{32}$ ($\frac{3}{4}$)
2. $2\times\frac{3}{8}$ ($\frac{3}{4}$) 5. $6\times\frac{1}{16}$ ($\frac{3}{8}$) 8. $8\times\frac{1}{12}$ ($\frac{2}{3}$) 11. $10\times\frac{3}{32}$ ($\frac{15}{16}$)
3. $5\times\frac{2}{15}$ ($\frac{2}{3}$) 6. $4\times\frac{3}{14}$ ($\frac{6}{7}$) 9. $7\times\frac{1}{14}$ ($\frac{1}{2}$) 12. $9\times\frac{1}{21}$ ($\frac{3}{7}$)

In the fifth grade, when we study fractions more fully, we shall work such examples a little differently.

See page 369.

WRITTEN EXERCISES

1. James bought 19 chicks at 17 cents apiece. How much did he pay for the chicks? **$3.23**

2. During the summer James bought grain 12 times for his chickens, and paid 75 cents each time. How much did he pay for grain? **$9.00**
3. In the fall James sold 6 chickens whose total weight was 27 pounds. What was their average weight? **4½ lbs.**
4. What did James receive for the 27 pounds of chickens at 22 cents a pound? **$5.94**
5. One month in the winter James got 36 eggs each week from 9 hens. How many eggs a week did these hens average? **4 eggs**
6. How much did James receive for his 36 eggs at 60 cents a dozen? **$1.80**
7. One month in the summer James sold 17 dozen eggs at 35 cents a dozen. How much money did he receive? **$5.95**
8. During the year James paid $3.23 for little chicks, $6.50 for chicken-house and run, $9.00 for feed. How much did his chickens cost him altogether? **$18.73**
9. During this time he sold chickens for $6.85, and eggs for $19.25. He estimates the value of his stock and equipment at $15.00. What is the sum of all these? **$41.10**
10. If any member of your class is raising chickens get him to make problems like these for the class to solve. The rest of the class may also make such problems.

See page 369.

ORAL EXERCISES

1. If you know the length, width, and depth in feet of an excavation, how do you find how many cubic feet are excavated?

2. If you know the number of cubic feet in a schoolroom, and also the number of children there are in the room, how can you tell how many cubic feet of air the room holds for each child?

3. If you know how many cubic feet there are in an excavation, how can you tell how many cubic yards there are in it?

4. If you know how many square feet there are in a floor, how do you find how many square yards there are in it?

5. If both terms of a fraction are multiplied by the same number, what is the effect on the value of the fraction?

6. If both terms of a fraction are divided by the same number, what is the effect on the value of the fraction? Show 5 and 6 by examples.

7. If you know how many years old a man is, how can you find how many days old he is?

8. If you know the length, width, and depth of a pile of ice, how can you tell how many tons there are in it? (See Example 1, page 251.)

9. If you know how many rods long and how many rods wide a field is, how can you tell how many acres there are in it?

10. If you know the number of front feet in a lot and the price per front-foot, how can you find the price of the lot?

See page 369.

ORAL AND WRITTEN EXERCISES

1. How much does it cost to send letters between any two places in the United States? Can you find out to what other countries we can send letters at the same rate? **2 cents**

2. How much does it cost to send an open circular letter? What is the price of a postcard? **1¢; 1¢**

3. One day a business house sent out 2848 letters, 580 open circulars, and 3500 postcards. What was the total cost of the postage? **$97.76**

4. One day a certain post-office sold 2-cent stamps for $284.60. How many letters could be sent for this postage? **14,230**

5. If the average letter weighs one-half ounce, how many such letters are there in one pound? In one ton? **32; 64,000**

6. Sending newspapers and periodicals by mail costs 1 cent a pound. How much does it cost to send one ton of periodicals by mail? **$20.00**

7. See if you can find out how much it costs to mail one copy of your daily paper. Also try to find out how much it costs to mail a copy of a magazine taken in your home.

8. Make other problems on using the mails. Find the rates of postage during the war, and make problems, using these rates.

See page 370.

Add:

1.	2.	3.	4.
4648	5324	7809	4807
291	6017	125	5217
7826	518	673	532
6400	305	1092	7631
628	4007	5630	719
7145	9732	875	2016
356	4385	6407	3508
2892	7219	3519	9173
1378	507	541	816
1982	1072	7163	5438
33546	39086	33834	39857

Multiply:

5.	8364	6.	5902	7.	1508	8.	6543
	87		136		314		217
	727668		802672		473512		1419831
9.	732	10.	6314	11.	2907	12.	7805
	47		231		399		217
	34404		1458534		1159893		1693685
13.	4823	14.	5629	15.	2007	16.	6351
	56		427		456		207
	270088		2403583		915192		1314657
17.	8902	18.	2137	19.	5432	20.	8537
	176		164		349		846
	1566752		350468		1895768		7222302

Divide:

	212-79		601-41		193-67
21.	88)18735	22.	256)153897	23.	72)13963
	2068		120-109		205-102
24.	39)80652	25.	469)56389	26.	289)59347
	220-4		236-176		62-153
27.	48)10564	28.	508)120064	29.	195)12243
	20-70		55-420		87-327
30.	480)9670	31.	2980)164320	32.	619)54180

See page 370.

WRITTEN EXERCISES

1. During the month of April Harry Forbes sold copies of the *Saturday Evening Post* as follows: 56 the first week, 67 the second, 53 the third, and 81 the fourth. How many *Posts* did he sell in all? He paid three cents apiece for the *Post*, and sold them for 5 cents. How much did he make selling *Posts* in April? **257 copies; $5.14**

(Unsold copies of the *Post* may be returned.)

Harry has a regular list of customers at whose houses he delivers papers each afternoon. He buys the papers from the publishers, and collects once a month from his customers.

2. During April Harry delivered papers as follows: the first week an average of 84 a day for six days, the second week an average of 87 a day, the third week an average of 86 a day, the fourth week an average of 88 a day, and the remaining two days of the month 89 copies each day. How many afternoon papers did he sell in April? **2248 papers**

3. Harry bought morning papers at $1.40 a hundred and sold them at 2 cents apiece. How much did he make by selling 500 papers? **$3.00**

4. He bought Sunday papers at 3½ cents apiece ($3.50 a hundred) and sold them at 5 cents apiece. From these facts make some problems on selling Sunday papers.

5. Make some problems on selling papers. See page 370.

WRITTEN EXERCISES

Play store. Make out sales checks for these purchases and find out how much change you should get in each case. Appoint one or two pupils auditors to see that your work is right. For form of sales check see page 199.

1.

½ lb. steak......	$ .18
½ lb. sausage....	.12
1 lb. bacon......	.20
Amt. recd.....	$1.00
Change,	**$ .50**

2.

5 lbs. sugar.....	$ .27
3 packages breakfast food......	.45
1 doz. eggs......	.28
2 lbs. butter.....	.70
Amt. recd.....	$5.00
Change,	**$3.30**

3.

½ doz. teaspoons	$3.25
½ doz. plated spoons.........	2.49
1 cream ladle....	1.69
1 salad set.......	3.98
Amt. recd.....	$12.00
Change,	**$ .59**

4.

1 boy's suit.....	$2.19
1 boy's cap.....	.19
1 boy's spring coat..........	2.49
1 pr. boy's shoes	1.75
Amt. recd.....	$7.00
Change,	**$ .38**

5.

1 girl's hat......	$1.38
1 girl's dress.....	4.39
1 umbrella.......	1.89
1 pr. gloves......	1.87
Amt. recd.....	$10.00
Change,	**$ .47**

6.

1 soap dish......	$.19
2 towel bars at 58¢ apiece....	1.16
1 brush holder...	.21
1 tumbler holder.	.20
Amt. recd.....	$5.00
Change,	**$3.24**

7.

1 brush.........	$0.79
Notions	.11
Comb...........	.35
Buckle..........	.29
Amt. recd.....	$2.00
Change,	**$ .46**

8.

1 pr. shoes......	$3.50
1 pr. rubbers....	.85
1 pr. slippers....	1.89
1 pr. low shoes..	4.50
Amt. recd.....	$15.00
Change,	**$4.26**

Drill in Fundamentals. Play the game on page 195, using examples in multiplication for the first event, and examples in long division for the second event. See page 370.

Prices of meat per pound:

Sirloin	30¢	Chuck roast	20¢
Round steak	28¢	Pork chops	32¢
Rib roast	24¢	Bacon	38¢

(16 ounces = 1 pound)

In selling meat the butcher cuts off pieces which he estimates equal to the amount asked for by the customer. Often the weight of the piece cut off is one or two ounces above or below the amount desired. The price is then figured to the nearest cent.

WRITTEN EXERCISES

At the prices given on this page, what will be the cost of the following meat purchases? Give as many as you can without using pencil and paper.

1. 18 ounces of sirloin.

Solution: 16 ounces, or 1 pound, costs 30 cents. 2 ounces is 2/16 or 1/8 of a pound. 1/8 of 30¢ is nearly 4¢. So the total cost is 30¢ plus 4¢, or 34¢.

2. 20 ounces of round steak. **$.35**
3. 4¾ pounds of rib roast. **$1.14**
4. 3¼ pounds of chuck roast. **$.65**
5. 22 ounces of pork chops. **$.44**
6. 26 ounces of bacon. **$.62**
7. 2½ pounds of pork chops. **$.80**
8. 1 pound 6 ounces of bacon. **$.52**
9. 24 ounces of round steak. **$.42**
10. 36 ounces of sirloin. **$.68**
11. 5 pounds 10 ounces of rib roast. **$1.35**

See page 370.

Discount and Net Price. Sometimes a storekeeper sells his goods at a discount to avoid carrying them over until the next season, or for other reasons. (See page 193.) The price after the discount has been taken off is called the *net price.*

ORAL AND WRITTEN EXERCISES

1. A dining table is marked $48.00. If the storekeeper takes off ¼ of the price, how much does he get for the table? **$36.00**
2. The price of a certain book is 44 cents, with one-fourth off for cash. What is the cash price. **33 cents**
3. A book is marked to sell at $1.50, with ⅕ of this price off for cash. What is the cash price of the book? **$1.20**
4. At a special sale in a store the following prices are given:

Suits,	$15.00	⅕ off	(**$12.00**)	Dresses,	$27.00	⅓ off	(**$18.00**)
Suits,	24.00	¼ off	(**$18.00**)	Dresses,	42.00	⅙ off	(**$35.00**)
Shoes,	5.00	⅕ off	(**$4.00**)	Coats,	35.00	⅕ off	(**$28.00**)

Find the net price of each article.

5. Find the net amount of each of the following bills:

6 dining chairs......	$27.00	1 suit..............	$28.00
1 parlor chair.......	9.50	1 overcoat..........	32.00
1 parlor chair.......	12.00	2 pr. shoes..........	9.50
1 rug..............	54.00	1 hat..............	4.00
1 rug..............	42.00	1 umbrella..........	3.50
1 sideboard........	60.00	6 pr. sox...........	3.00
1 leather couch.....	60.00	4 ties..............	3.00
3 bedroom chairs...	10.50	3 suits underwear..	5.00
	$275.00		**$88.00**
⅕ off	**55.00**	¼ off	**22.00**
	$220.00		**$66.00**

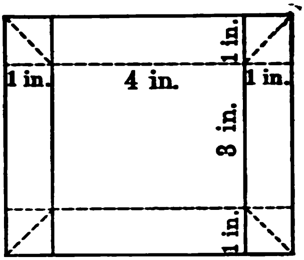
To find the net amount of each of these bills, add to see how much it amounts to before taking off the discount. Then find the discount and subtract it.

See page 371.

ORAL EXERCISES

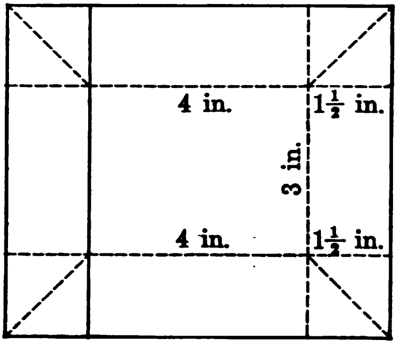
1. Take a sheet of paper and ask your teacher to show you how to fold it to make a box. She will show you how to fasten the corners. Try to make a cover for the box.

2. How long is your sheet of paper? How long is the box?



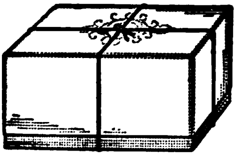
3. How long and how wide a sheet do you need to make a box 4 inches long, 4 inches wide and 2 inches deep? Measure the sheet, then make the box to see how long it is.

4. Take a sheet of paper 6 inches long and 5 inches wide. Fold it to make a box 4 inches long and 3 inches wide. How deep is it?



5. Make a box 6 inches long, 4 inches wide and 2 inches deep. How large a sheet do you need for this box?

6. What are the dimensions of the paper shown in this figure? What are the dimensions of the box to be made from it? How many cubic inches will it hold?

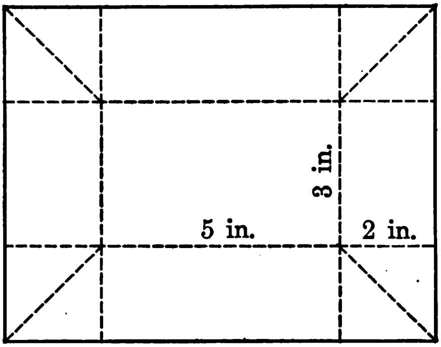


See page 371.

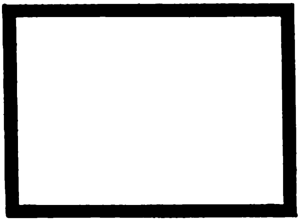
7. What is the length of ribbon required to tie a box 6″ by 4″ by 3″ as shown in the figure, allowing 8 inches for tying?

ORAL AND WRITTEN EXERCISES

1. What are the dimensions of the box which may be made by folding the paper represented in the figure? What are the dimensions of the paper before it is folded? 5″×3″×2″;9″×7″

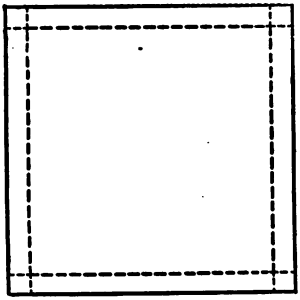


2. A girl is binding a picture 8½″ long and 6¼″ wide with passe-partout paper. How many inches of the paper does she need? 29½ in.



3. Some girls are hemstitching napkins 18″ by 18″. How many yards of hemstitching are there in each napkin? 2 yds.

4. Make a sewing box 6 inches long, 4 inches wide, and 3 inches deep. How many square inches are there in the top and bottom? in the two sides? in the two ends? How many square inches of silk will it take to cover the whole box? 48; 36; 24; 108



5. A picture frame 18″ by 14″ outside measure, and with an opening 14″ by 10″, is to be covered with gold leaf. How many square inches of gold leaf are needed? 112

See page 371.

A grammar school building has just been built, and the new furniture is about to be bought.

WRITTEN EXERCISES

1. There are 8 rooms with 36 seats in each, and 12 rooms with 42 seats in each. How many pupils will the building seat altogether? 792

2. How many dozen desks will be needed for the building? How much will they cost at $54.00 a dozen? 66; $3564

3. Twenty teachers' desks are bought at $12.50 each. How much do these cost? $250

4. What is the cost of 22 revolving chairs at $6.50 apiece? $143

5. How much do 30 chairs cost at $1.50 apiece? $45

6. An office desk for the principal costs $40.00, a filing cabinet costs $85.00, and a typewriter $65.00. What is the price of all of these? $190

7. Five rooms are fitted out with map cases at $48.00 each. How much do these cost? $240

8. Globes are bought for $120, charts $150, books $320, other articles $280. How much do all these cost? $870

9. Make problems about furnishing a school building, and solve them. Try to find the actual cost of various items of furniture in your school, such as desks, maps, chairs, etc.

See page 371.

1. In a school 135 tons of coal, costing $6.75 a ton, are used during the year. How much does the coal cost? **$911.25**

2. In a town there are 418 children in the elementary schools. What is the cost of providing schooling for each child if the city spends $16720 each year on these schools? **$40**

3. In a private school the children pay $75 for tuition each year. At this rate, how much would the 418 children of Example 2 pay? **$31,350**

4. In one town $125,400 is spent each year to maintain the public schools. How much per day is this, if the schools are open 190 days in the year? **$660**

5. In a town it is found that it costs on an average $275 per day to run the schools. How much per year is this if the schools run 200 days per year? **$55,000**

6. A gymnasium costing $9675 is added to a school building with 215 pupils. How much per pupil does the gymnasium cost? **$45.00**

7. In a large city a school building was built and equipped at a cost of $274,000. What was the cost per pupil if there were 1370 pupils in the building? **$200.00**

8. For one school 140 primary arithmetics are bought for 33¢ ($.33) apiece, 90 intermediate arithmetics for 36¢ ($.36) apiece, and 70 advanced arithmetics at 45¢ ($.45) apiece. How much do all these books cost? **$110.10**

9. Try to find how much it costs to supply your school with new arithmetics.

10. Try to find how many children there are in the schools in your city or district, and also how much is spent yearly on these schools. How much is this per child?

See page 371.

What different materials have you seen used for sidewalks? Concrete walks are laid at so much per square yard.

WRITTEN EXERCISES

1. A man has a lot fronting 60 feet on the street. How much will it cost him to lay a concrete walk 6 feet wide in front of this lot at $1.40 a square yard? **$56.00**

2. A board sidewalk costs $1.10 per square yard. How much does a boardwalk 6 feet wide and 240 feet long cost? **$176.00**

3. At $1.55 per square yard, what is the cost of a walk 6 feet wide and 360 feet long? **$372.00**

4. A man had to build a sidewalk 6 feet wide and 75 feet long. Instead of letting this work on contract he decided to buy his own material and hire the work done by the day. Material cost him: cement $5.80, crushed stone $8.00, sand $4.50. He hired one team 4 days at $4.25 a day, and another $2\frac{1}{2}$ days at $4.00 a day. He also hired 3 men $1\frac{1}{2}$ days at $2.25 a day to put down the walk. What was the total cost of the walk? What was the cost per square yard? **$55.43; $1.11**

Drill in Fundamentals. Play the game on page 195, using examples in addition for the first event, examples in subtraction for the second, examples in multiplication for the third, and examples in division for the fourth event.

See page 372.

ORAL EXERCISES

1. How can you find how much it costs to send a certain number of letters by mail? How do you find how much it costs to send a certain number of postcards.
2. How can you find out how much it costs to send a certain number of pounds of periodicals by mail?
3. If you know how much a boy paid for newspapers, and how much he sold them for, how can you tell how much he made by selling them?
4. If you know how much money a man had when he went into a store, and also how much he had when he came out, how can you tell how much he spent in the store?
5. If you know how many chairs are needed for a large hall, and the cost per dozen, how do you find the total cost of the chairs?
6. If you know how much it costs to run a school, and also the number of children there are in the school, how can you tell how much it costs to provide schooling for each child?
7. If you know the price at which goods are marked in a store, and also the discount allowed, how do you find the net price?
8. If you know the dimensions of a sidewalk in feet, how do you find the number of square yards in it?
9. Tell fully how you could find how many cubic feet of air for each pupil your schoolroom holds?
10. If you know how many pupils there are in a school, and also how many teachers, how can you find how many pupils there are for each teacher?

See page 372.

WRITTEN WORK

1. A farmer sold 38 hogs at an average price of $26.75. How much did he get for all of them? $1016.50
2. He also sold 17 head of cattle for $1139.00. What was the average price per head? $67.00
3. He sold 24 tons of hay at $11.40 per ton. How much did he get for his hay? $273.60
4. He bought 7 young calves at $13.00 per head, and 11 pigs at $7.50 per head. How much did these cost him? $173.50
5. A man worked 27 days at $2.25 a day. How much did he earn? $60.75
6. A man is paid $1764 for his year's work. How much per day is this if he works 294 days in the year? $6.00
7. A man bought an automobile for $1750, used it two years, and sold it for $976. How much less than he paid for it did he get when he sold it? $774
8. A certain family had an income of $2480 for the year. They spent $480 for rent, $650 for food, $350 for clothing, and $700 for other purposes, and saved the rest. How much did they save? $300
9. At 280 words on a page, how many pages and how many words over will there be in a book of 95,000 words? 339 pages and 80 words
10. How many square rods are there in one acre? How many acres are there in a field 45 rods wide and 80 rods long? 22½
11. How many acres are there in a square field 160 rods on each side? 160
12. Draw a diagram of a piece of land ¼ of a mile wide and ¾ of a mile long. Let 1 inch represent 40 rods.

page 372.

1 × 2 = 2
2 × 2 = 4
3 × 2 = 6
4 × 2 = 8
5 × 2 = 10
6 × 2 = 12
7 × 2 = 14
8 × 2 = 16
9 × 2 = 18
10 × 2 = 20

1 × 3 = 3
2 × 3 = 6
3 × 3 = 9
4 × 3 = 12
5 × 3 = 15
6 × 3 = 18
7 × 3 = 21
8 × 3 = 24
9 × 3 = 27
10 × 3 = 30

1 × 4 = 4
2 × 4 = 8
3 × 4 = 12
4 × 4 = 16
5 × 4 = 20
6 × 4 = 24
7 × 4 = 28
8 × 4 = 32
9 × 4 = 36
10 × 4 = 40

1 × 5 = 5
2 × 5 = 10
3 × 5 = 15
4 × 5 = 20
5 × 5 = 25
6 × 5 = 30
7 × 5 = 35
8 × 5 = 40
9 × 5 = 45
10 × 5 = 50

1 × 6 = 6
2 × 6 = 12
3 × 6 = 18
4 × 6 = 24
5 × 6 = 30
6 × 6 = 36
7 × 6 = 42
8 × 6 = 48
9 × 6 = 54
10 × 6 = 60

1 × 7 = 7
2 × 7 = 14
3 × 7 = 21
4 × 7 = 28
5 × 7 = 35
6 × 7 = 42
7 × 7 = 49
8 × 7 = 56
8 × 7 = 63
10 × 7 = 70

1 × 8 = 8
2 × 8 = 16
3 × 8 = 24
4 × 8 = 32
5 × 8 = 40
6 × 8 = 48
7 × 8 = 56
8 × 8 = 64
9 × 8 = 72
10 × 8 = 80

1 × 9 = 9
2 × 9 = 18
3 × 9 = 27
4 × 9 = 36
5 × 9 = 45
6 × 9 = 54
7 × 9 = 63
8 × 9 = 72
9 × 9 = 81
10 × 9 = 90

2 × 10 = 20
3 × 10 = 30

4 × 10 = 40
5 × 10 = 50

6 × 10 = 60
7 × 10 = 70

8 × 10 = 80
9 × 10 = 90

ORAL EXERCISES

Cover up the answer column and read rapidly, giving the answers. Then cover up all but the answers and read the tables rapidly.

Also construct division tables. Cover them up and read in the same way.

Read the tables on the next page in the same way.

See page 372.

5 cents = 1 nickel
10 cents = 1 dime
5 nickels = 1 quarter
5 dimes = a half-dollar
10 dimes = 1 dollar
4 quarters = 1 dollar
100 cents = 1 dollar

12 units = 1 dozen

8 quarts = 1 peck
4 pecks = 1 bushel
32 quarts = 1 bushel

12 inches = 1 foot
3 feet = 1 yard

4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon

9 square feet = 1 square yard

7 days = 1 week
60 minutes = 1 hour
60 seconds = 1 minute
24 hours = 1 day

16 ounces = 1 pound
2000 pounds = 1 ton

5280 feet = 1 mile
320 rods = 1 mile
16½ feet = 1 rod
5½ yards = 1 rod
1760 yards = 1 mile
160 square rods = 1 acre
640 acres = 1 square mile

January,	31 days
February,	28 days
March,	31 days
April,	30 days
May,	31 days
June,	30 days
July,	31 days
August,	31 days
September,	30 days
October,	31 days
November,	30 days
December,	31 days

In a leap-year February has 29 days. An ordinary year has 365 days, and a leap-year has 366 days.

See page 372.

INDEX

Acre, 244
Addition by endings, 72, 73, 74, 75, 76, 78, 80, 81, 84, 85, 86, 89, 90, 4, 108, 109
  combinations, development of, 2, 3, 4, 8, 10, 12, 22, 24, 34, 37, 45, 54
  drill in, 8, 10, 11, 13, 23, 32, 36, 37, 45, 48, 54, 58, 59, 60, 72, 78, 80, 81, 84, 85, 86, 91, 108, 132, 134, 153, 160, 171, 182, 186, 187, 188, 200, 206, 210, 218, 228, 256, 267
Applications, mixed, 31, 83, 106, 118, 127, 142, 179, 180, 207, 223, 224, 225, 226, 278
  acre, 244, 245
  ages of children, 14, 256, 257
  bills, 189, 196, 257
  birthday party, 44
  boy's garden, 143, 168, 169, 216, 217
  buying coasting outfit, 127
  buying fruit, 202
  buying groceries, 129
  buying milk, 104
  buying school supplies, 21
  buying valentines, 128
  carfare, 95
  cash receipts, 188
  Christmas candy, 95
  Christmas gifts, 96, 97
  city lots, 242, 243
  cutting ice, 250, 251
  distances between cities, 190
  dozen, 30, 50, 170
  dry measure, 138, 139
  excavations, 247
Applications, mixed, farm problems, 154, 155
  fruit stand, 107
  going to store, 9
  hauling hay, 119
  hen and chickens, 7
  lemonade stand, 66, 67
  liquid measure, 57
  making sidewalk, 276
  measuring length, 27, 46, 47
  merry-go-round, 64
  milk supply, 131
  picnic party, 46
  playing hide-and-seek, 5
  playing store, 16, 17. 43, 113, 198, 269
  postage, 178, 266
  poultry raising, 264
  sales checks, 199
  saving money, 79, 87, 140, 201
  school problems, 55, 89, 191, 214, 274, 275
  selling papers, 88, 268
  sewing, 220
  speeds and distances, 240, 241
  thermometer, 222
  time, 60, 62, 63, 68, 167, 200
  weight of boys and girls, 158, 256, 257
Areas, 121, 145, 221, 244, 245
Averages, 214

Bills, 189, 196, 257
Bushel, 138

Copying figures, 187
Counting, 1, 4, 18, 20, 39, 51
Cubic measure, 247, 248, 249

Decimal number system, 33, 38, 39, 50, 82, 183, 227
Denominator, 208
Development of addition combinations, 2, 3, 4, 8, 10, 12, 22, 24, 34
  of fractions, 28, 29, 40, 52, 53, 61, 133, 258, 259, 260, 261, 262, 263
  of multiplication combinations, 18, 20, 24, 35, 52, 56, 61, 121, 122, 123, 130, 133, 336
Difference, 17
Difficult combinations, 23, 31, 54, 101, 123, 135
Division, 133, 157, 164, 173, 174, 175, 261
  checks on, 174, 175
  long, 231, 232, 233, 234, 235, 236, 237, 252, 253
  short, 174, 175, 211, 212, 215
Dividend, 174
Divisor, 174
Dozen, 30, 50, 170
Drawing to scale, 120, 169, 204, 205, 216
Drills in addition, 8, 10, 11, 13, 23, 32, 36, 37, 45, 48, 54, 58, 59, 60, 72, 73, 74, 75, 76, 77, 78, 80, 81, 84, 85, 86, 91, 108, 132, 134, 153, 160, 171, 182, 186, 187, 188, 200, 206, 210, 218, 228, 256, 267
  in division, 36, 48, 105, 173, 174, 175, 211, 212, 213, 219, 228, 231, 233, 234, 235, 237, 252, 253, 267
  in multiplication, 20, 41, 48, 100, 126, 127, 132, 135, 145, 146, 147, 148, 149, 150, 151, 153, 156, 160, 165, 172, 182, 197, 201, 206, 210, 219, 228, 254, 267
  in subtraction, 8, 10, 11, 13, 23, 34, 37, 45, 59, 60, 67, 92, 94, 113, 114, 115, 116, 117, 124, 132, 134, 160, 171, 182, 192, 200, 206, 218, 228
Dry measure, 138, 139
Estimating, 27, 46, 47, 234, 236, 252

Foot, 27, 46, 70, 145, 244, 280
Fractions, 28, 29, 40, 50, 52, 53, 100, 101, 133, 208, 209
  addition of, 262
  multiplication of, 263
  reduction of, 259
  subtraction of, 262
  terms of, 260

Gallon, 104, 105
Games, 10, 15, 16, 19, 25, 26, 27, 71, 103, 195
  used in addition, 10, 15, 23, 25, 26, 46, 48, 71, 91, 201, 206, 210, 219
  used in division, 219, 228, 244, 254, 261, 269
  used in fractions, 29, 53, 105
  used in measuring, 27, 47
  used in multiplication, 35, 41, 99, 123, 133, 137, 144, 147, 150, 165, 195, 197, 201, 206, 210, 219, 228, 254, 269
  used in subtraction, 10, 15, 67, 124, 201, 204, 206, 219

Half, 28
Hundred, 82

Inch, 27, 47, 70

Linear measure, 27, 46, 47, 70, 145, 244, 280
Liquid measure, 57, 104, 105, 138

Making change, 16, 116
Making problems, 3, 5, 7, 12, 16, 21, 22, 29, 30, 44, 55, 101, 120, 125, 128, 138, 139, 141, 154, 173, 176, 201, 268, 274, 275
Minuend, 113

Multiplication, 18, 36, 126, 127, 148, 149, 151, 152, 156, 194, 199, 229, 230, 279

New number facts, 2, 4, 8, 10, 12, 18, 20, 23, 24, 30, 34, 35, 37, 40, 41, 45, 54, 56, 61, 99, 101, 122, 130, 136, 144, 150
Numerator, 208

Ounce, 158, 159

Peck, 138
Pint, 57, 104, 105
Postage, 26, 178
Pound, 158, 159
Problems without numbers, 176, 177, 215, 246, 265, 277
Product, 18

Quart, 57, 104, 105, 138
Quotient, 98, 164

Reading numbers, 38, 39, 82, 110, 111, 183, 227
Rectangle, 35, 52, 53, 120, 121, 169, 204, 205, 216, 217, 221, 242, 243, 244, 245
Reduction of fractions, 259
Remainder, 164
Rod, 244
Roman numerals, 62, 63, 185

Saving, 79, 87, 140, 201
Scale, drawing to, 120, 169, 204, 205, 216
Simplest form, 260
Speeds, 240, 241
Square foot, 145
  yard, 145
  rod, 244
Subtraction, 6, 8, 10, 17, 23, 92, 94, 113, 114, 115, 116, 117, 124, 192
Subtrahend, 113
Sum, 2

Temperature, 222
Thermometer, 222
Time, 60, 62, 63, 68, 70, 162, 163, 166, 167
Ton, 251

United States money, 16, 42, 70, 86

Volume, 247, 248, 249, 250, 251

Week, 60, 70
Weight, 93, 118, 119, 158, 159
Writing numbers, 38, 39, 50, 83, 110, 184

Yard, 46, 70, 145

NOTES FOR THE TEACHERS' EDITION

The purpose of the teachers' edition is to enable the teacher to do better work by relieving her of a part of the drudgery which has been thought inseparable from her work. The chief means by which it is sought to attain this general purpose are the following:

1. In the notes to each page it is stated what matter on that is new and what is review and drill.

2. A series of review drills are suggested which can be given without the use of any supplementary material. It is no small task for a teacher to plan a series of such drills so as to distribute them properly over the course and among the various operations. In these drills the same material is sometimes used more than once, but care is taken that considerable time will intervene between two uses of the same material.

3. A series of tests are suggested by which the teacher and the children may learn which of the fundamental combinations have not been mastered perfectly. (See pages 317-319 and 340-342.)

4. A series of time tests are suggested to ascertain whether the children have reached the normal standard in speed and accuracy. (See pages 357, 358.)

5. The use of local material is suggested at points where it may be brought in most profitably. In order that such material may be collected at leisure a list is given at the beginning of the notes. (See pages 286-288.)

6. Copious informal suggestions are made all along and it is believed that each suggestion may be of help to some teacher, though even the greater part of them may be superfluous to many.

Every device which relieves the teacher of unnecessary labor helps to set her mind free for her real task, which is the leading onward in the best way each of the little personalities entrusted to her care. To this end the authors of these books have worked with sincerity of purpose.

The best work in arithmetic is possible only when considerable local material is used. Such material can be collected with little difficulty, if it is known some time in advance just what will be needed. For this reason a list is given below of the material which will be needed throughout this book. The children like to help collect material, and by so doing not only increase their own interest, but also relieve the teacher of work.

The page in the text where each item will be needed is given opposite the description of it

Page 9. Prices of things costing 6¢ or less. Use things that the children see in the stores near the school. Bring in prices of as large a variety of such things as convenient.

Page 21. Prices of things costing 10¢ or less. See preceding note.

Page 40. Practical uses of tally marks, such as tabulating votes in an election.

Page 42. Things sold at local stores for a nickel, a dime, a quarter, a half dollar, and a dollar.

Pages 50 and 170. List of things sold or counted by the dozen. Simple practical uses of parts of a dozen

Page 57. Practical uses of the pint and the quart.

Page 64. Special uses of the nickel, such as for carfare and other purposes.

Pages 83 and 111. Practical uses of large numbers, such as telephone numbers, house numbers, automobile numbers, and so on.

Page 87. Prices of Christmas presents such as children would be likely to buy.

Pages 88 and 168. Actual local data about the selling of newspapers. Get the price which the newsboys pay for the papers and also the price they get for them, and find out the actual business arrangements which are made with the newsboys.

Page 95. Inquire whether any of the children are making Christmas candy, and if so, find what ingredients they are using and how much these ingredients cost. For suggestions see page 95 of the text.

Page 118. The dates of births and deaths of men well known in the locality, as well as of men of national or world interest.

Also find actual instances of hay or coal delivered, the weight of the load with the wagon, and the weight of the wagon without the load, and treat this material as similar material is treated on page 119.

Page 125. Prices in local stores of articles of interest to the children and reductions in price made for special sales. See the page in the text for suggestions.

Page 138. Practical uses of the pint, the quart, and the bushel. Find just how the grocers sell potatoes or fruit of various kinds. Be sure to get the actual local usage. Such uses varies a great deal from place to place throughout the country.

Page 141. Railroad fares between points of interest in the immediate locality.

Pages 143 and 168. Data from a boy's garden. Such data should be obtained from a garden actually taken care of by some boy in the class. If there is no such boy in the class, there should be no effort made to get data to cover this point.

Page 154. If the school is in the country, find the actual value of horses, cows, pigs, eggs, and so on, and also the prices which farmers receive for corn and other items listed on pages 154 and 155; the number of bushels of corn that they get from an acre, etc.

Page 189. Store bills. If possible, get actual bills which have been rendered to persons in the community, and have the children work with such bills.

Page 196. Laundry bills. See remarks in preceding note.

Page 199. Sales checks. See remarks in preceding note.

Page 201. Data from the school savings bank, if there is one in operation in the school.

Page 202. The prices of fruit in nearby stores.

Pages 203 and 270. The prices paid for meat in the butcher shop. Get prices of various cuts of meat.

Page 214. The attendance in your school for each day of a recent week, or for each day of a recent month.

Page 220. Actual data arising from work in sewing.

Page 222. Data on temperatures, such as the highest temperature for the week, the lowest temperature for the week, the highest temperature ever recorded in the locality, the lowest, and so on.

Page 241. Speeds of local trains. These can be obtained from a time table showing when a train leaves a certain station and when it arrives at the next station. The time table will also contain good material for finding the distances between stations. The finding of the distance will usually involve a problem in subtraction.

Page 242. The size of lots in your city. The number of lots in a block. The number of flats or apartments on a block.

Page 243. The prices of lots in your city, and the manner in which the prices are given, such as, so much per lot, so much per front foot, or so much per square foot, as the case may be.

Page 247. The dimensions of a basement that is actually being dug in the locality. This means, of course, the dimensions of the excavation being made, and not the dimensions of the finished basement.

Pages 254 and 255. Height and weight of boys and girls in the class.

Page 264. Data on the raising of chickens. See notes to pages 143 and 168.

Page 270. See note to page 203.

Page 271. Reductions in price, or discounts that are being offered at certain sales.

Page 274. The cost of furnishing a school building. See notes to this page in the general notes.

Page 275. The number of pupils in a school or school district, and the cost of running the school. See general notes to page 275.

Page 276. The actual local cost of building a concrete walk. See general notes to page 276.

Page 1

New Matter. Reading about numbers and answering printed questions.

Remarks. Up to the time the text is put into the child's hands his instruction in numbers has been largely by word of mouth, and learning by means of the printed page is new to him. For this reason the number element brought in here is such as is familiar to the average child at this stage.

Page 2

New Matter. The "New Number Facts." The idea of addition, the plus sign, and the equality sign.

Remarks. It is good practice to reserve a small part of the blackboard on which to write the new number facts as they are learned. In this way the class has continually before it a definite record of those number facts for which it is responsibile at any one time. Only the numbers to be added should be written, the sums being omitted. This list of number facts may then be used for short, snappy class drills. The order in which these drills are given should be varied from day to day so as to prevent the child from learning the results in a definite order. Now and then the list should be arranged on the board in a different order, so as to prevent the child from associating the answers with certain places on the board.

A sharp distinction should be made between what the child has learned and what he has not learned. Only by so doing is solid progress possible. For this reason the new number facts are set out clearly in the text as they are brought into the course.

In counting objects we do not really count one, two, three, and so on. We see the objects in groups and then count by adding the groups. Thus in counting five objects we are very likely to see a group of three and a group of two, and then take them together to get five. Counting by 2's is especially common. The child should be drilled to count objects in this way, and thus to make use of the simplest number combinations.

Page 3

New Matter. Reading about numbers. Number stories about objects that are not before the child.

Remarks. On this page number combinations are first applied to objects seen in the picture and then to objects seen only in the child's mind. It is not only necessary that the child should learn the number facts from concrete situations actually experienced by him, but that he should learn them in such a way as to be able to apply them where much of his attention must be directed to the situations to which thay are applied. The teacher must be fully aware of the additional difficulty which arises from the fact that the objects to which the number combinations are applied are not present even in a picture. In practical life, however, this is the kind of application which we are constantly required to make.

The telling of number stories by the child himself is an important matter. In this way he will become more keenly aware of the value of numbers and of the role they are made to play. Most of our education can be criticised justly by saying that it begins and ends with the repetition of words found on a printed page. The number stories told by the child surely are not subject to this criticism. The value of such stories as language lessons is not easily overestimated

Page 4

New Matter. The "New Number Facts." Numbers to be added written in columns; writing numbers to 10; $4+2=2+4$, etc.

Review and Drills. Addition combinations to 6.

Remarks. Have the children cut out cards just a little larger than ordinary playing cards and write on them all addition combinations with sums six, or less. Write the numbers in columns. This will be a good opportunity to get the children to make an effort to write numbers well. They can easily be stimulated to make fine-looking cards, and no card is fine-looking unless the numbers on it are written well. This is a mcre effective method for getting the children to write numbers than simply to give them copy and ask them to reproduce it.

In this way each child will make for himself a set of cards, usually called "desk cards" or "shuffle cards," which he can use for seat work. He simply goes over his cards, writing the sums on a sheet of paper. This affords convenient and effective seat work in numbers.

Let it be understood that it does not matter which of two numbers is above the other on the cards. This will bring out clearly that 2+4=4+2; 5+1=1+5, etc. The object should be to have the child learn the addition combinations in such a way that he simply takes the two numbers together, irrespective of the order in which he finds them. This can easily be done, many remarks to the contrary notwithstanding.

Page 5

New Matter. Applying known number combinations to concrete situations.

Review and Drill. Addition combinations to 6.

Supplementary Matter. New number stories, to be made up by the children.

Remarks. From the very outset, it should be insisted that the number facts already learned, or at least those that have been placed on the board among the "new number facts," should be known perfectly. The sums should be given quickly and without hesitation. If this is insisted on from the very beginning and throughout the year's work, these number facts will be learned thoroughly.

The child should be asked to tell his own number stories and he should be made to tell them in reasonably good English and in a snappy and bright way. The number stories must be reasonable. It would not be reasonable, for instance, for only two to play hide-and-go-seek. Have the children tell about the game of hide-and-seek with the object of bringing it vividly before the children so that when they tell number stories about it, the numbers are actually applied to things which are real to them. The stories may be told in such a manner that the children will be very nearly as interested as if they were playing the game itself.

Page 6

New Matter. Given the sum of two numbers and one of them to find the other.

Review and Drill. Sums to 6. Subtraction, with no minuend greater than 6.

Remarks. Say nothing about subtraction here. Treat the page solely as addition. Be sure to bring the play element into the circle drill. If a child is told that he falls down when he makes a mistake, it has a fine effect on him. The children should be allowed to make circles on the board and run around them to see how fast they can go without falling. While nothing is said to the child about it here the teacher should have clearly in mind that this is the beginning of subtraction.

Page 7

Review and Drill. Sums and differences involving no number greater than 6.

Remarks. Treat this page first as a reading lesson. Have the children tell about chickens, where they find their food, where they sleep, and so on and so on. The purpose is to develop a clear idea about the facts to which numbers are to be applied. If the number facts to be used are known thoroughly, the main attention may be given to the facts in life to which the number combinations are applied. That is the way that numbers are used in real life.

Supplementary Matter. Number stories to be told by the children.

Page 8

New Matter. The "New Number Facts." $3+4=4+3$.

Review and Drill. Sums to 7, when both addends are given, and also when the sum and one addend are given.

Supplementary Matter. Write on the board all addition combinations learned thus far, putting down the sums. Cover up one of the addends and ask the children to give it. Work very rapidly and permit no hesitation.

Remarks. In the written work, insist on reasonably neat papers. Lack of neatness does not by any means consist entirely in the writing of poor figures, or possibly not even principally in that. It consists to a large extent in the scattering of the work all over the sheet in a disorderly manner. The child can be taught at this early stage to arrange his work in an orderly and effective way.

Page 9

Review and Drill. Sums to 7.

Remarks. Be sure to have the children bring in prices that are actually paid in their immediate neighborhood.

The distinction between number facts themselves, such as, $4+3=7$, and the application of these number facts to concrete things, should be borne clearly in mind. Thus, if four cents is paid for a spool of thread and three cents for a skein of silk, we find that the amount of the two is obtained by using the addition combination. Simple as this is, it is the beginning of the distinction the child must learn to make as to what situations in life call for the use of a particular one of the various operations in arithmetic.

Supplementary Matter. New number stories to be made up by the children; local price lists to be brought in by them.

Page 10

New Matter. The "New Number Facts."

Review and Drill. Addition and subtraction combinations, the subtraction being put in the form of addition with one of the addends omitted. Do not use the word "subtraction" here.

Remarks. In using the circle be sure to make full use of the play element. See notes to page 6. Notice that in the use of the rectangle we are really laying the first foundation for the idea of the area of the rectangle. The rectangle contains so many squares along one side, and so many rows of such squares. This will occur again and again as the work goes on and will serve to build up the whole idea of measuring the area of a rectangle. Later the matter will be faced directly.

Page 11

Review and Drill. Addition and subtraction combinations with sums to 8. Subtraction combinations in the form of addition with one addend omitted.

Remarks. Note that the combinations $5+2$ and $2+5$ are put side by side in the addition drill and also in the subtraction drill. To vary the work, have the children read by columns instead of by lines; also read the lines backwards and columns upwards. The great difficulty with exercises of this sort is, that while one pupil is occupied reading the examples, the minds of the others are likely to wander. Any device that will overcome this is useful. Skipping around the class rapidly will help, and the resourceful teacher will find many other devices. She should never lose sight of the ideal that all the children are to be fully occupied with number work during the whole number period.

Page 12.

New Matter. The "New Number Facts."

Remarks. If convenient, use toy money for the work on this page. However, this is not of as great importance as is sometimes thought. The children can make rings on paper to represent cents, and these will be about as real to them as the coins themselves.

Problems 5 and 6 present the two aspects of subtraction. By this time the teacher will decide whether the "taking away" method or the "additive" method is to be used. If the "taking away" method is used, then to solve No. 6, 10 marks, or ten cent pieces should be used; 6 of them should be taken away and those that are left, counted. If the "additive" method is used, then 10 marks should be made and 6 of those marked off and those that are left will be the number that one must add to 6 to get 10. That 4 will be left is known at once, because the child knows that 6 plus 4 make 10; or, putting it a little differently, he knows that in order to get 10 when one has 6, one must add 4. In any event, all the information needed is obtained from the addition combination, $6+4=10$.

Page 13

Review and Drill. Sums to 10; subtraction with the minuend 10 or less.

Remarks. Note that in the subtraction problems two combinations such as $10-9=?$ and $10-1=?$ are placed together in pairs. The reason for this is clear. See the notes to page 11.

Page 14

Applications. Addition and subtraction combinations to 10 applied in concrete problems.

Remarks. On this page conditions requiring addition or subtraction are described in a variety of terms. The child should not be asked to give his reason for his choice of operation at this time. If he chooses the correct one, that is sufficient evidence that he understands what he is doing. However, the child may show, by means of counters, or marks, the reason for his choice of operation.

Supplementary Matter. Have the children make problems (number stories) similar to those on this page. It will happen frequently that their problems will involve numbers greater than 10. If they do not know the combinations which such problems require, there will arise a need for such combinations and this will afford excellent motivation for studying them. Whenever such instances arise, never fail to point out just what arithmetic is required that has not yet been learned.

Page 15

Review and Drill. Addition combinations.

Remarks. Never fail to let the play element stand out prominently. If the child is told that he falls off the ladder whenever he makes a mistake he will take greater care to be accurate. Children have been heard to say that they hurt themselves "awfully" when they fall off, and that they have to be very careful.

Supplementary Matter. Number ladders and circles should be drawn on the board. The children will like to make them, and will play just a little more enthusiastically if they have made them themselves. Circles should be drawn on the board to be used as the circles are used on this page.

Page 16

New Matter. Making change. The dime, and the nickel.

Review and Drill. Sums and differences to 10.

Remarks. The children will like to make "play money." All that is required is to cut pieces of paper (possibly colored paper) into squares, trim the corners a little, and then mark on them values, such as one cent, five cents, and ten cents. Things to be sold can be provided by writing the names of the articles on pieces of paper. Let the children discuss what articles they want to sell, and the prices. Care should be taken that the prices are reasonable and within the limits of the child's attainments in arithmetic. Frequently we fail to make full use of the child's imagination. A slip of paper with pencil marks on it will serve the child just as well as a real article of merchandise. The making of these slips affords excellent motivation for writing, and only those children who write fairly well should have their products accepted for a place on the table. The storekeeper should make change in the same way as in a real store; that is, in the way suggested on this page. In the beginning, the teacher should act as storekeeper and later some child should be selected. If the children discover that the storekeeper has made a mistake, the child who makes the discovery is made storekeeper and the old storekeeper is dismissed. Do not allow the children to linger too long at the counter.

A table will serve as a counter. One of the most common mistakes is to have too much paraphernalia. Children like to make-believe, and this enables us to use very simple equipment. Care must be taken not to allow this game to degenerate into mere fun. The children should be kept busy at number work as much of the time as possible. One way to accomplish this is to have two or more stores; that is, two or more tables, in different corners of the room.

Page 17

New Matter. Formal subtraction. The minus sign. The writing of the minuend and subtrahend in a column.

Remarks. At this point tell the children which method of subtraction is to be used (the "addition" or the "taking away" method). Before deciding which of the two methods to use look over pages 92, 113, 114, 115, 116 in this book; pages 54, 55, 247 in Book II, and pages 15, 42, 56 in Book III of this series. This series of books is so constructed as to make the use of either method equally easy so far as the book is concerned. There are reasons for and against both of the two methods in general use.

The so-called Austrian or additive method of subtraction undoubtedly has pedagogical and psychological advantages. The only combinations to be learned are the addition combinations, and these are made to apply directly to subtraction. The borrowing is avoided, and the carrying substituted, a process to which the child is accustomed from addition. This method is now being used in about one-half of the schools in the United States, having a slight preponderance in the larger school systems, and being somewhat in the minority in the smaller ones.

The reasons that can be urged against it are, chiefly, that it is likely to meet with opposition among some of the older teachers, and also to be looked at askance by the parents. Frequently parents like to help the children with their school work, and this they cannot do effectively if methods are used which differ from those with which they are familiar. This consideration is more serious in a small school system, where the criticisms of the parents find more direct and effective expression in the conduct of the school. Opposition of this sort, however, is encountered by every improvement, especially where it affects many people. The teacher or the principal will have to use his or her judgment in weighing these various arguments one against the other. The choice of method once being made should, however, be adhered to definitely throughout the course.

It is sometimes stated that the additive method cannot be used effectively in subtracting fractions, mixed numbers, or compound denominate numbers. These objections are not well founded, as will be seen by consulting the pages where these topics are introduced in these books. See the pages cited above.

Page 18

New Matter. The "New Number Facts." Counting by 2's. The multiplication sign.

Remarks. Write a column of figures on the board, making every alternate figure heavier, and then have the children count, putting emphasis on the numbers in heavy type. This produces a sort of rhythm which leads to the counting by 2's. Have the children draw a rectangle 2 in. wide and 5 in. long, mark it off into squares, and count these squares by 2's. Draw a rectangle 2 in. wide and 3 in. long and show that it represents three 2's and also two 3's, and in that way get the child to see that $3\times2=2\times3$. Also show this by making dots as shown in the figure on this page. The teacher should have in mind that this use of rectangles divided into squares serves to develop the idea of the area of the rectangle, though nothing should be said at this time about areas. Though $4\times2=8$ and $2\times4=8$, are equivalent combinations, they are for the present listed as separate number facts. See page 99 of the text.

10
9
8
7
6
5
4
3
2
1

Page 19

New Matter. A Number Game.

Remarks. The number game described on page 19 is very valuable if the teacher gives it with snap and vigor. A good number game should possess several characteristics, among which are the following:

It should bring into play clearly the element of group rivalry.

It should keep all the children busy with arithmetic throughout the game.[1]

On this page the child is asked to make a note of those number combinations which give him trouble, and then practice on them. As early as possible, the child should be led to take charge, in part, of his own education. If he finds out for himself what his shortcomings are, it will be very much better than if he has to be told that he has trouble with such-and-such combinations.

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[1] A more detailed discussion of the use of games is to be found in the chapter on Motivation in "The Teaching of Arithmetic" by N. J. Lennes.

The cards used in this game, usually called "flash cards," should be made in the schoolroom, and as far as possible by the pupils themselves. They should be about 3″×5″ in size and the numbers may be put on with water colors and brush or with crayons. The making of such cards will be valuable practice for the children in doing orderly work and in writing figures well. Only the cards which show good workmanship should be used in the games.

Page 20

New Matter. The "New Number Facts." Counting by 3's.

Review and Drill. Table of 2's as far as learned.

Remarks. Write a column, emphasizing every third figure, similar to the column shown in the note to page 18. Count by 3's, using this column. Note that in such expressions as $4\times ?=8$, the problem is really one of division. The answer is obtained by dividing by 4. This is a direct application of the definition of division, viz., "Division is the process of finding one of two numbers when their product and the other number are given." At this time say nothing to the child about division. Let him find the missing number simply as a result of the multiplication tables. When he comes to a formal explanation of division, the process will be clear to him, and the only new thing he will have to learn is the word "division."

Page 21

Review and Drill. Addition and multiplication facts as far as 10.

Remarks. If local prices are not known by the children from their experience in buying things, have them obtain such prices, but without becoming obnoxious to the local dealer. Real courtesy can be taught very early and very practically by direct application in matters of this sort. The children should be taught that people should not annoy anyone unnecessarily, not even a storekeeper.

Supplementary Matter. Bring in local prices, and use them as prices are used on this page.

Pages 22 and 23

New Matter. The "New Number Facts."

Remarks. If the children are not familiar with the production of corn they should be told something about it. They should also be led to talk about mice, what they live on, how destructive they are, and of the value of keeping a cat in keeping down their number. Really good work cannot be done unless the subject matter to which the arithmetic is applied becomes vivid and clear to the child.

In playing the game described on page 19, it will be well to keep the records of several successive games so that a team contest will arise among the rows. The children in each row should be encouraged to help their team mates so that their row will do well. By judicious use of this plan the most intense interest can be awakened. For the two games suggested on page 23 use flash cards with the following sets of combinations:

$$\begin{array}{cccccccccccccccccccccc} 3&4&3&2&2&6&5&2&3&4& &7&4&6&5&4&3&6&7&9&8\\ \underline{4}&\underline{2}&\underline{2}&\underline{2}&\underline{5}&\underline{1}&\underline{2}&\underline{3}&\underline{3}&\underline{3}& &\underline{3}&\underline{5}&\underline{3}&\underline{6}&\underline{7}&\underline{8}&\underline{5}&\underline{4}&\underline{2}&\underline{3} \end{array}$$

Page 24

New Matter. The "New Number Facts."

Review and Drill. Addition combinations. Counting by 2's and 3's.

Remarks. Let the child actually make groups of dots and show that $8+4=12$ and $7+5=12$, as indicated. Also let him count objects to ascertain the number facts. The child should always be made to see that the new number combinations which he learns arise out of his environment and his own experience. In that way the combinations will be real and practical to him. We should begin early to build in such a way that our product may not justly be called "educated fools." One way to prevent that is to keep the child's feet firmly planted in the ground of common sense.

Columns of figures may be written as suggested in the note to page 18 and used as shown there.

Page 25

New Matter. A Number Game.

Review and Drill. Addition combinations to 12.

Remarks. This game is of value when used at comparatively rare intervals in the early stages.

Page 26

New Matter. A Number Game.

Review and Drill. Addition and subtraction combinations.

Remarks. This game is of value if several sets of rings or boards are used so that all the children can play at the same time. In some schools it is played at recess on rainy days. It has the obvious defect that it may permit some of the children to wander away from the subject. Many of the games described in the current teachers' literature have this defect.

Page 27

New Matter. Measuring length. The inch, and the foot. Estimating lengths.

Remarks. The measurements are to be made to the nearest inch. Of course, no measurement is exact. If the child thinks, for instance, that a certain distance is nearer 8 inches than either 7 or 9 inches, he may call it 8 inches. At this early stage we do not say, "approximate measurement," which is what all measurement really is; but we may say that we measure to the nearest inch. Note that all measurements on this page require only one application of the foot rule; that is, all lengths to be measured are 12 inches or less. The purpose in estimating lengths is not to develop great skill in judging distances very closely, but to obtain reasonable ideas of the lengths of the units of measure of distance, and also to obtain reasonable ideas of the measured magnitude of familiar objects. There is no great virtue in being able to estimate the width of a schoolroom within one foot, but one should be able to estimate it with certainty within ten feet, and possibly within five feet. Estimating and then measuring lends much greater interest to the work of measuring.

Page 28

New Matter. One-half of a number. Writing the fraction $\frac{1}{2}$.

Review and Drill. The foot, the inch. Measuring.

Remarks. The fraction $\frac{1}{2}$ of a number is obtained by actually taking a number of things and dividing them into two equal groups; that is, a fraction of a number is made to depend in the first instance upon direct experience with things. But very soon it is connected with multiplication. That is, we finally learn that $\frac{1}{2}$ of 8 is 4 **because** $2\times4=8$. No great stress should be put upon this relation at this early time. Simply have the child notice that $\frac{1}{2}$ of 6 is 3 because there are two 3's in 6; that is, because 2×3 is 6. As we go on we shall find this idea developed so that all fractional relations of this sort are obtained directly from the multiplication table.

Page 29

New Matter. One-fourth of a number; one-third of a number. Writing the fractions $\frac{1}{3}$ and $\frac{1}{4}$.

Remarks. The development of these is precisely like that described in the note to page 28. Thus $\frac{1}{3}$ of 9 is finally seen to be 3, **because** 3×3 is 9, and so on. The final purpose is to have the child relate the number facts in his mind in such a way that when he knows $2\times4=8$, he will then at once know that $4\times2=8$, $\frac{1}{2}$ of 8 is 4, and $\frac{1}{4}$ of 8 is 2. This fundamental and far-reaching principle is worked out systematically throughout this book.

For the game suggested on page 29, have the children make flash cards. The teacher should keep these cards for future use.

Page 30

New Matter. The "New Number Facts." Further development of the idea of multiplication and of a fraction of a number.

Remarks. The child should be made to see that multiplying by an integer is simply using the multiplicand as an addend a certain number of times. (Of course this language should not be used to the child.)

Page 31

Review and Drill. The number combinations 5+6, 4+5 and 5+7, together with the corresponding subtraction relations.

Among the addition combinations with sums 12 or less, the three given here are those which cause the most trouble. On this point see page 311. However, the combinations which are usually most difficult may not be the most difficult for some particular child. Each child should be asked to make a list of the combinations which cause him the greatest difficulty and to practice on them. Let each child make his own list of demons and conquer it. See note to page 19.

Page 32

Review and Drill. All addition combinations with sums up to 12.

Remarks. Note that on the first part of this page combinations are given in pairs, such as 7+5 and 5+7. Then, on the lower part of the page the combinations are given in mixed order. See notes to page 11. The teacher should permit no loitering. There should be quick response. The more definitely the mind is concentrated, the more enthusiastically will the children work. This affords an opportunity for the making of lists of the more difficult addition combinations such as have been suggested earlier in this book.

Page 33

New Matter. Study of the decimal number system and the Arabic notation from 10 to 20.

Remarks. The children should be taught to see that the number in the second place from the right represents tens, while the number in the first place represents ones. This is the beginning of the study of the principle of place value in our system of notation. The teacher should have clearly in mind that there is a sharp difference between the essential principle of the **decimal number system** by which we use 10 as a base and the essential principle of the so-called Arabic or Hindoo system of numerals which is the principle of place value. The Romans used the decimal number system, but they were very far from having developed our system of numerals.

Page 34

New Matter. The "New Number Facts."

Review and Drill. Subtraction, minuend 13 or less.

Remarks. The number of stripes on the flag will be known to the child and also the number of each kind of stripe. This should bring home to him quickly the combination 6+7=13. In this way he should learn easily and effectively one of the most troublesome of all the addition combinations.

Page 35

New Matter. The "New Number Facts."

Review and Drill. Table of 2's.

Supplementary Matter. Draw a rectangle to show, for instance, that 6×2=2×6. Point out that in such a rectangle there are two rows of 6 squares each, and 6 rows of 2 squares each; that is, 2×6=6×2.

Page 36

New Matter. Numbers to be multiplied written in a column.

Review and Drill. The table of 3's, as far as 4×3; the table of 2's, as far as 10×2; also questions within these tables of the following kind: What number multiplied by 3 equals 12? Two times what number equals 12?

Remarks. Use cards containing the multiplication tables already learned and play the game on page 19. The flash cards used for addition with the following set of combinations may be used:

$$\begin{array}{ccccccccccccccc} 1 & 3 & 2 & 6 & 2 & 3 & 1 & 5 & 4 & 2 & 1 & 3 & 6 & 1 & 7 \\ \underline{1} & \underline{4} & \underline{1} & \underline{2} & \underline{2} & \underline{3} & \underline{3} & \underline{2} & \underline{1} & \underline{4} & \underline{5} & \underline{2} & \underline{1} & \underline{8} & \underline{1} \end{array}$$

Each card should be exhibited for a very short time, so as to develop quickness and aggressiveness on the part of the child. They should also be exhibited in as quick succession as possible, so as to get the child to write results promptly. Children are usually slow in reacting, but much can be done in stimulating them to quickness of action.

Page 37

New Matter. The "New Number Facts."

Review and Drill. Addition and subtraction combinations as far as the number 14.

Supplementary Matter. There is a consensus of opinion that among addition combinations, whose sums are 14 or less, the most difficult are the following:

$9+5$, $9+4$, $9+3$, $8+5$, $8+6$, $8+3$, $7+6$, $7+5$, $7+4$, $6+5$, $9+2$.

Let each child add to this his own list of demons. See notes to pages 19, 31, and 54.

Remarks. Practice writing results in order by columns as well as by lines.

Pages 38 and 39

New Matter. The decimal number system. Notation.

Remarks. Again the element of place value can be brought out. Do not at this time attempt to make a general statement about this principle. Simply point out the fact which is now definitely before the child, that a figure 1, 2, 3, 4, or 5, standing in the first place to the right, represents ones, while the same figure standing in the second place from the right represents tens. In this way we shall build up without formal statements the general idea of place value. At this point read the note to page 33 in regard to the difference between the decimal number system and the Arabic system of numerals.

Page 40

New Matter. The "New Number Facts." Tally marks. One-fifth of a number.

Review and Drill. The fractions $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$.

Supplementary Matter. Ask the children to find out some purposes for which tally marks are used. They should be able to bring in a good many cases where things are counted up and these marks are used. After this, use tally marks in keeping score in number games. Write a column of numbers, underlining every fifth number, and then count along this column. (See note to page 18.) Finally count to 25 by 5's.

Page 41

New Matter. The "New Number Facts."

Supplementary Matter. See note to page 40. For the game on this page use the following combinations:

$$\begin{array}{ccccccccccccccc} 3 & 5 & 3 & 1 & 4 & 6 & 3 & 1 & 1 & 9 & 5 & 3 & 2 & 1 & 2 \\ \underline{5} & \underline{1} & \underline{4} & \underline{4} & \underline{5} & \underline{1} & \underline{3} & \underline{1} & \underline{7} & \underline{2} & \underline{5} & \underline{1} & \underline{7} & \underline{9} & \underline{1} \end{array}$$

Show flash cards and say "times" or "multiply."

Page 42

New Matter. The quarter, the half-dollar, the dollar.

Review and Drill. The nickel and the dime.

Supplementary Matter. Have the children bring in actual prices for which familiar things are sold in the neighborhood; have them tell what can be bought for a nickel, for a dime, for a quarter, for a half-dollar, and for a dollar. Prices of many things should be brought in, and then snappy oral exercises made by using these prices. Carfare at 5 cents, something or other at 10 cents, and so on. This should form a very interesting basis for valuable work.

Page 43

Review and Drill. United States money,—the nickel, dime, quarter, and dollar.

Supplementary Matter. See note to page 42. Make play money. See note to page 16 for arranging the store. Have the children tell in what coins they could have 10 cents, 15 cents, 20 cents, 25 cents, 9 cents, 14 cents, 16 cents and so on. Also have them tell in what coins change could be given in certain situations. Thus: "If a boy buys something for 20 cents and gives a quarter in payment, tell in what coins the change could be given." Arrange many simple exercises of this sort. If children have trouble answering these questions, let them make change as the storekeeper does.

Remarks. Remember that the sums to 14 only are known at this point. This, however, will not prevent handling larger numbers in making change and in telling coins in which change can be given.

Page 44

Remarks. This page should be treated at first as a reading lesson. The children should be given overnight to make good number stories about John's birthday, and tell them on the following day. These stories afford a good opportunity for giving good language lessons. "See how well you can tell your story." "Tell it some other way." "I do not understand exactly what you mean." These are remarks which the teacher may use to get the child to do his very best to tell his story clearly. One of the purposes of the work in arithmetic is to develop the ability to express his thought clearly.

Page 45

New Matter. The "New Number Facts."

Review and Drill. Addition and subtraction combinations to 16.

Page 46

New Matter. Using the yardstick in measuring length.

Review and Drill. The foot; the inch; estimating and measuring lengths by using the foot-rule.

Remarks. See notes to page 27.

Page 47

Review and Drill. Estimating lengths and measuring in inches.

Remarks. The game on this page involves very careful measurement, inasmuch as the children will take great care to show which one has drawn a line most nearly one foot long. This may be a good opportunity to refine the measuring by introducing half-inches and quarter-inches. At this time, however, the child cannot measure more closely than to a quarter of an inch. This game may be varied by asking the children to draw on a piece of paper a line six inches long, one eight inches, one four inches, and so on, and then exchanging papers and measuring to find by how much the drawings are wrong. If the teacher thinks best, a definite competitive game similar to the one described on page 19 may be arranged.

Page 48

Review and Drill. Multiplication tables as far as learned; finding unknown factors when the products and one factor are given; this being confined to the tables already learned.

Supplementary Matter. In the game use the following combinations:

5	1	7	8	5	3	9	5	2	4	3	5	3	4	5
6	8	5	2	8	2	5	2	6	2	3	5	4	5	3

Remarks. After playing the game suggested on this page, let each child make a list of his errors, if any. Keep this list for future reference. Some time later he will again have a game of the same sort and will again be asked to make a list of his errors. Then see if he has removed the troubles which occurred the first time. If he has not, this will be an additional reason for giving particular attention to the combinations in which he is making errors repeatedly. For a convenient method of recording errors see the notes to page 71.

Page 49

Remarks. At first treat this page as a reading lesson. In answering the questions the child must, of course, decide more or less consciously what operation is needed in each case. Have the child tell whether he **adds, subtracts,** or **multiplies.** Get him accustomed to use these words because they are definitely associated with the operations they name, while **and, less, times,** are directly associated in his mind with certain facts in life, and not necessarily with the formal processes of arithmetic. The purpose is to associate each fact or situation with the appropriate process. Do not ask the reason for this choice of operation. The child is now beginning to solve the most difficult problem in arithmetic; namely, to decide what operation to use in a given situation. That is, the purpose of pages of this sort, and the problem that the child is trying to solve is not at all easy for him. Later on he will be asked to give reasons for his choice of operation. If he makes the right choice at this time, that should be sufficient; if not, the use of counters or marks should be employed.

Page 50

New Matter. The dozen.

Review and Drill. Parts of 12.

Supplementary Matter. Have the children tell about as many things as they can that are sold by the dozen or counted by the dozen. Have them make new problems involving a dozen. Thus, if eggs are 40 cents a dozen, how much will six eggs cost? May's mother kept chickens and sold eggs. One day, May helped her mother and her mother gave her three eggs to take to the store, with which to buy some candy. How much money would she get for the three eggs if eggs were forty cents a dozen? How much money did she have with which to buy candy?

Page 51

New Matter. Decimal number system, 50 to 100. Arabic numerals, 50 to 100.

Remarks. (Read note to page 33.) Use bundles of splints to develop the number system. Again, point out the element of place value. We are now in a position to say that any digit in the second place from the right represents tens, and we may therefore tell the children that this is "tens' place." Similarly any digit standing in first place to the right represents ones, and this place may therefore be called "ones' place."

Page 52

Review and Drill. Fractions of numbers within the multiplication table as far as learned.

Remarks. Instead of drawing rectangles and dividing them into squares, we may cut out pieces of paper and fold them. Of course, it all amounts to the same thing, but there is spice in variety. Note the systematic and persistent development of the relation between the facts of the multiplication table and fractional parts of numbers, such as, from $3 \times 5 = 15$ it follows that $\frac{1}{3}$ of 15 is 5 and $\frac{1}{5}$ of 15 is 3. It is by careful organization of this sort that the study of arithmetic can be made less laborious and the time devoted to it possibly reduced. See notes to page 10.

Notice also that folding paper as suggested on this page helps to develop the area of the rectangle. This idea is developed consistently throughout the treatment of the multiplication table, and the result will be that, purely incidentally and without effort, the child will obtain a thoroughgoing idea of the area of the rectangle as the product of the base and the altitude. The teacher should be fully aware of the purposes in work of this sort. It is only by having such purposes constantly in mind that the most effective work can be done.

Page 53

New Matter. Fractions of numbers other than unit fractions, such as two-thirds of a number, three-fourths of a number, and so on.

Remarks. Two-thirds of nine, or two-thirds of twelve can be seen directly from the figures shown on page 52. There will be no difficulty whatever in understanding the meaning of such fractions. Thus, three-fourths of 12 will come just as naturally as 3×3, since it is known thoroughly that one-fourth of 12 is 3. Success in teaching depends for one thing, upon the thoroughness with which the subsidiary notions are developed.

Supplementary Matter. For the game suggested here, use the following combinations:

$\frac{1}{5}$ of 30, $\frac{1}{5}$ of 35, $\frac{1}{5}$ of 40, $\frac{1}{9}$ of 45, $\frac{1}{2}$ of 14, $\frac{1}{8}$ of $\frac{1}{16}$, $\frac{1}{9}$ of 18, $\frac{1}{6}$ of 30, $\frac{1}{8}$ of 40, $\frac{1}{5}$ of 45, $\frac{1}{7}$ of 14, $\frac{1}{2}$ of $\frac{1}{16}$, $\frac{1}{2}$ of 18, $\frac{1}{5}$ of 25, $\frac{1}{3}$ of 12.

Flash cards may be made and the game on page 19 used.

Page 54

New Matter. The "New Number Facts."

Review and Drill. Addition combinations of all numbers less than 10 taken two at a time.

Supplementary Matter. For the number game suggested here, the following combinations may be used:

$$\begin{array}{cccccccccc} 8 & 6 & 9 & 8 & 9 & 9 & 8 & 9 & 8 & 7 \\ \underline{9} & \underline{5} & \underline{9} & \underline{8} & \underline{4} & \underline{8} & \underline{7} & \underline{6} & \underline{3} & \underline{5} \end{array}$$

Remarks. All addition combinations to be listed as new number facts have now been given. Frequent drills in these combinations should be given from time to time. The teacher should arrange some convenient method so that each child can keep a list of the errors which he makes in each of these review drills. The method suggested in the notes to page 71 may be used. As far as possible the child should be urged to take charge of his own education. Let him make a list of his own errors and see to it that he corrects them. One ounce of self-direction is worth a pound of direction.

Most of the work in the review drills will naturally be on the more difficult combinations, but once in a while drill work should be given covering those that are usually regarded as easier. It will be found that some children will make errors in the easier ones. There is no need to worry about such combinations, as, for instance 7 plus 0. It may be that the young child will make a mistake now and then in adding zero, but that is the kind of a mistake which will inevitably be corrected in the process of time. No intelligent child of twelve or thirteen years of age is likely to make such an error, unless he is confused by some special situation, while he might easily make an error in adding 8 to 9.

The following are generally supposed to be the most difficult among the 45 addition combinations:

8 + 9
7 + 9
6 + 7
9 + 6
8 + 6
7 + 6
9 + 5
8 + 5
7 + 5
6 + 5
9 + 4
7 + 4
5 + 4
9 + 3
8 + 3

Several investigations have been made to determine which combinations are the most difficult to learn and retain. But such investigations are very difficult to make inasmuch as it is almost impossible to control the amount of time and attention which the child gives to each combination. One of the authors of these books has secured a combined estimate of many groups of teachers as to the relative difficulty of the addition and multiplication combinations. These estimates show a remarkable agreement, and it is from these that the above list has been made.

Page 55

Supplementary Matter. Have the children make number stories pertaining to the school. See who can bring in the best stories.

Remarks. The number stories to be used here must of course be such that the child can handle the number elements involved. If stories should be told involving number combinations which the child cannot yet handle, it will afford a good opportunity to point out that it is necessary for him to learn more about numbers. This page is different from most of the pages of application given in the book, in that the work is grouped about a more general idea, namely, the school, and this permits of a considerable variety of problems. Most cases of application in this book are grouped strictly about a very simple idea which contains a certain dramatic interest. Problems which occur in real life are in general grouped about a more general idea, such as the problems on this page, and we must gradually lead up to this general situation.

Page 56

New Matter. The "New Number Facts."

Remarks. Ask the children how many squares can be built with 8 sticks, 12 sticks, 16 sticks, 20 sticks, 24 sticks. Have them draw squares as well as make squares with sticks.

Page 57

New Matter. Liquid measure; pint; quart.

Review and Drill. The table of 2's.

Remarks. Admit only such uses of the pint and the quart as are actually made in everyday life. The children will bring in a good many supposed uses of these measures which are not practical. Be sure to admit only such uses as are in actual practice. It is just as important to teach the children what these measures are used for, as it is to teach them the relation between the quantities contained in the measures.

Supplementary Matter. Have children tell the uses of the pint and the quart.

Drill in Fundamentals. Use the following subtraction combinations, playing the game on page 19:

$$\begin{array}{cccccccccc} 9 & 11 & 7 & 9 & 11 & 10 & 8 & 7 & 8 & 12 \\ \underline{5} & \underline{5} & \underline{4} & \underline{4} & \underline{3} & \underline{3} & \underline{5} & \underline{4} & \underline{3} & \underline{5} \end{array}$$

Pages 58 and 59

New Matter. Adding columns of figures consisting of more than two numbers. Checking addition.

Review and Drill. Addition and subtraction combinations.

Drill in Fundamentals. Use the following subtraction combinations, playing the game on page 19.

$$\begin{array}{cccccccccc} 16 & 14 & 17 & 13 & 15 & 16 & 13 & 14 & 11 & 15 \\ \underline{7} & \underline{9} & \underline{8} & \underline{7} & \underline{7} & \underline{9} & \underline{4} & \underline{9} & \underline{3} & \underline{9} \end{array}$$

Remarks. More than two numbers in a column were added on page 26 in connection with the game of keeping score, but the numbers there were small and the fact that there were more than two of them was purely incidental. We now face this problem essentially for the first time.

Note that whether these columns are added up or down each step is within the fundamental combinations. In no case is the child asked to add a number to 10 or more.

Checking addition is introduced for the first time here. Our final aim should be to have every problem checked so as to make the computer certain that his results are correct. We should proceed on the principle that no amount of care in computing will insure accuracy. This can be insured only by checking. By beginning early and sticking to it constantly, the object may be attained.

Page 60

New Matter. The number of days in a week.

Review and Drill. Addition and subtraction combinations.

Page 61

New Matter. The "New Number Facts."

Review and Drill. Multiplication tables as far as learned.

Drill in Fundamentals. Use the following combinations in a drill in multiplication:

4	4	5	5	4	6	7	4	3	5	6	5	9	9	1
4	1	9	1	6	1	5	3	5	8	5	4	2	1	8

Remarks. While the drawing of triangles and the counting of sides, involves precisely the same ideas as building triangles with number sticks, these latter are nevertheless justified for the sake of variety. It is important to do several things involving the same number idea for the purpose of allowing the mind time to dwell on the idea itself, and thus to master it more thoroughly. It is also important that the idea comes to the child from several sources, so that it may be linked with several chains of associations.

Supplementary Matter. Draw triangles and count sides.

Pages 62 and 63

New Matter. Reading the clock. Roman numerals.

Drill in Fundamentals. Use the following combinations for a drill in multiplication:

3	1	7	2	3	1	4	9	5	7	2	4	5	8	5
6	1	3	1	8	3	6	5	7	2	8	5	3	5	6

Remarks. The child learns a great deal more about the face of the clock and the telling of the time of day by making a clock face such as is suggested here and then setting the clock to various hours of the day, than he can possibly learn in the same length of time by just looking at a clock. The children will take real interest in making the clock face and fastening the hands on it. They will also take interest in counting up the number of minutes in one hour, in a half-hour, and in a quarter of an hour. They should not attempt to mark off the minutes, but simply to put on the twelve numbers, and then they should be told that there are five-minute spaces between any two consecutive numbers. The work of finding the number of minutes then becomes practically the process of counting by 5's. The children themselves will easily think of interesting hours of the day other than those given on page 63, and will set their clocks to show these hours. At this time, say nothing about the structure of the Roman numerals; just learn to read the numbers given here.

Page 64

Review and Drill. The table of 5's. The nickel, the quarter, and the half-dollar.

Supplementary Matter. Give oral drills on paying carfare, and on other situations where a nickel is used in payment. The children will again take interest in finding situations where the nickel is used in this way.

Page 65

Review and Drill. The table of 5's. Subtraction within the fundamental facts of addition. Adding columns of three figures.

Supplementary Matter; Drill in Fundamentals. Use flash cards for a drill in addition:

9	8	7	9	8	8	7	9	9	4	6	8	7	8	7
5	3	4	6	5	7	6	6	7	3	5	9	6	6	5

Pages 66 and 67

Review and Drill. The nickel, the dime. The table of 5's. Subtraction within the fundamental addition facts.

Supplementary Matter. Again, have the children tell about such situations as they can, where the nickel and the dime are used in payment.

Drill in Fundamentals. Play game on page 19, using the following subtraction combinations:

16	15	15	16	15	14	14	13	13	14
7	8	9	9	7	8	9	6	8	5

12	15	15	14	13	13	13	13	13	12
7	8	6	6	7	5	4	9	7	5

Page 68

New Matter. The written representation of the time of day. The reading of the clock.

Remarks. Notice that in none of the questions on this page are the children asked to find the length of time from such an hour as 10 : 50 to 11 : 10. That is, they never skip over the hour mark. This is a difficulty which will be taken up later.

Pages 69 and 70

Review and Drill. Addition and multiplication combinations and fractional parts of numbers and all denominate numbers thus far learned.

Drill in Fundamentals. Use the following combinations: $\frac{1}{4}$ of 24, $\frac{1}{4}$ of 16, $\frac{1}{5}$ of 20, $\frac{1}{3}$ of 15, $\frac{1}{8}$ of 24, $\frac{1}{7}$ of 21, $\frac{1}{6}$ of 12, $\frac{1}{6}$ of 24, $\frac{1}{4}$ of 20, $\frac{1}{5}$ of 15, $\frac{1}{3}$ of 24, $\frac{1}{3}$ of 21, $\frac{1}{2}$ of 12, $\frac{1}{3}$ of 9, $\frac{1}{5}$ of 10.

Remarks. The two pages, 69 and 70, contain the essential elements of arithmetic thus far introduced.

Page 71

New Matter. A number game.

Review and Drill. The fundamental addition combinations.

Recording Errors. Let each child rule a sheet of paper into 45 rectangles and write one of the 45 addition combinations in each rectangle as follows:

Tests on Fundamental Combinations. On pages 317-319 is a series of tests whose purpose is to review the addition combinations, and to discover which ones each child does not know well. The records of errors made up in the way suggested on the opposite page will indicate to each child the combinations to which he needs to pay particular attention.

It is suggested that about half of these tests be given by means of flash cards, as described on page 19 of the text, and the other half be given as suggested on page 71. For this purpose flash cards will be needed for all the 45 addition combinations and for 80 subtraction combinations. In this way the child will be tested both through the eye and the ear. Games of competition as described on pages 19, 71 of the text may be used.

In these tests every one of the addition combinations occurs at least twice. The most difficult ones occur in every addition test. The tests may be given one each day, or possibly two each day, until finished. It is intended that they should be given at the beginning of the third grade.

1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9
2+2	2+3	2+4	2+5	2+6	2+7	2+8	2+9	3+3
3+4	3+5	3+6	3+7	3+8	3+9	4+4	4+5	4+6
4+7	4+8	4+9	5+5	5+6	5+7 /	5+8	5+9 ///	6+6
6+7	6+8	6+9 /	7+7	7+8	7+9 //	8+8	8+9 /	9+9

On a record sheet like the above let each child show how many times each combination is missed in these drills. The record given here shows that 5+7, 6+9, 8+9 were missed once each, 7+9 was missed twice, and 5+9 was missed three times.

First test in addition.

7	7	4	5	6	2	8	4	4	8	5	3	8	5	2	9	5	5	8	5
9	3	4	7	9	3	9	8	9	3	9	6	7	3	7	9	6	7	2	8

Second test in addition.

7	4	6	6	3	2	8	4	2	1	1	8	5	7	6	5	3	4	2	7
9	9	9	9	9	8	8	7	7	7	9	5	8	5	7	5	9	6	1	2

Third test in addition.

9	9	9	9	9	9	8	8	5	8	7	9	9	8	6	6	8	4	8	3
7	8	4	5	6	7	6	4	5	7	3	9	1	5	2	3	4	4	2	3

Fourth test in addition.

1	4	1	2	2	4	3	8	2	6	5	3	6	6	7	6	5	4	8	7
1	6	5	9	5	7	5	8	8	6	7	6	7	8	8	9	9	9	9	9

Fifth test in addition.

7	8	4	5	6	7	4	6	5	2	3	9	1	5	2	3	1	4	1	1
9	9	9	9	9	8	5	7	8	7	9	9	8	6	6	8	6	8	4	2

Sixth test in addition.

7	3	5	8	1	4	2	2	4	1	7	7	8	4	5	6	7	6	6	5
7	9	5	8	9	7	5	9	4	6	2	9	9	9	9	9	8	8	7	8

Seventh test in addition.

9	1	5	2	3	1	4	1	1	6	5	5	3	6	7	6	5	4	8	7
9	8	6	6	8	6	8	4	3	6	7	8	6	8	8	9	9	9	9	9

Eighth test in addition.

7	4	6	5	7	7	8	4	5	6	3	1	8	1	4	1	4	3	2	3
8	5	7	8	7	9	9	9	9	9	9	7	8	9	7	3	6	3	9	4

Ninth test in addition.

3	2	2	3	2	4	1	8	2	6	5	2	6	6	7	6	5	4	8	7
7	2	4	9	4	7	9	8	8	6	7	7	7	8	8	9	9	9	9	9

Tenth test in addition.

7	1	4	5	6	4	6	3	5	5	3	9	5	5	3	3	3	4	2	3
9	7	9	9	9	5	8	6	8	7	9	9	5	6	4	8	3	8	2	7

First test in subtraction.

9	16	7	17	8	10	8	4	14	14	9	11	9	6	12	13	11	8	9	16
3	8	4	9	1	4	6	3	9	8	2	5	3	4	6	9	3	5	2	9

Second test in subtraction.

9	17	8	10	8	4	14	14	9	11	9	6	16	12	13	7	1	8	9	13
3	9	1	4	6	3	9	8	2	5	3	4	8	6	9	4	3	5	2	9

Third test in subtraction.

9	17	3	8	11	8	14	14	6	9	9	6	16	10	17	13	11	11	11	16
6	8	2	7	2	2	5	6	5	7	6	2	9	9	8	4	8	4	5	7

Fourth test in subtraction.

9	13	3	10	11	4	11	11	6	11	12	12	16	10	17	11	14	11	11	12
4	9	1	6	9	1	8	7	1	6	4	3	7	1	9	2	5	7	6	7

Fifth test in subtraction.

9	13	15	13	10	4	11	11	5	14	12	12	12	7	10	11	14	14	12	12
5	4	8	5	5	2	3	4	2	7	8	9	7	6	8	9	9	6	3	5

Sixth test in subtraction.

12	10	7	13	13	5	8	8	9	15	15	6	9	7	7	13	13	14	15	12
4	7	3	8	6	1	5	4	1	9	7	3	5	1	5	5	7	8	6	8

Page 72

New Matter. Serial addition, or what is often called addition by endings. Sums of numbers in "ones' place" less than 10.

Page 73

New Matter. Serial addition, sums of numbers in "ones place" greater than 10. (This operation is also called "bridging the tens.")

Remarks. It has been urged by distinguished educators that the child will not, for instance, pass from 7+8=15 to 27+8=35. It is quite true that he will not do so unless the connection is pointed out to him and drill is given in doing this thing, but it is equally true that a reasonable amount of practice will enable the child to see at once that 77+9=86, because he knows that 7+9=16. The work of serial additions must be done before the child learns to carry. If it is not, he will inevitably add by carrying, and this he cannot do in adding columns. This serial addition is a preparatory step to adding columns.

Page 74

Remarks. The table on this page will be used later for serial addition and for other purposes. Copy this table and paste it on a stiff cardboard for later use. Each child should have a copy of it for his own use.

Pages 75 and 76

Review and Drill. Serial adding.

Page 77

New Matter. Adding columns of more than three figures.

Remarks. If the children hesitate in adding columns, give further drill on serial adding. The serial adding is justified only in so far as it carries over into column addition.

Page 78

New Matter. Adding two-figure numbers. No carrying.

Review and Drill. Serial adding.

Supplementary Matter. If thought best, drill may be had in adding other numbers to the rows and the columns of the table on page 74.

Remarks. The child knows about "ones" and "tens"; that the figure in the first place to the right represents "ones" and that the figure in the next place represents "tens." We now simply say that we add the ones first and then the tens. There is no need at this time to repeat the explanation about ones and tens or about the principle of place value. The form shown on this page indicates what the child may be asked to say when making a verbal statement about the process.

Page 79

Applications. Use of addition and subtraction in problems on saving money.

Review and Drill. Adding two-figure numbers.

Remarks. Introduce a discussion about the saving of money. Have the children tell how much they save, how they make their money, and whether or not they intend to spend all that they make. One boy, for example, has a rule that he can spend one-half of the money he earns, while he puts the other half into the savings bank. It may be brought out here that a dollar left in a savings bank one year earns three or four cents, so that in one year there will be, not $1.00, but $1.04 in the bank. It will not be possible at this stage to bring out fully the reasons for saving money, but a beginning can be made. If the idea of saving is built up consistently, during the whole school course, and without preaching or scolding, considerable can be done in developing those elements in human nature which are necessary for thrift and welfare.

Page 80

New Matter. Adding two-figure numbers. Carrying.

Review and Drill. The addition combinations.

Remarks. The explanation which needs to be given at this stage is suggested by the following:

The teacher says, "In adding 28 and 35, what is the sum of the ones?" "In 13, what does the 3 represent? What does the 1 represent? Write the 3 in ones' place below the line, and add the 1 to the tens. Why is the 1 added to the tens?"

In explaining the second example, the teacher may say, "What is the sum of the ones?" Answer: 24. "In 24 what does the 4 represent? What does the 2 represent? Write the 4 in the ones' place below the line, add the 2 to the figures in tens' place. Why is the 2 added to the figures in tens' place"? Answer: Because it represents tens.

The word "carrying" should be used, and no more elaborate explanation should now be attempted than the one given here.

Some teachers object to the word "carrying," but there seems to be little reason for the objection. Every dictionary of any consequence gives the word with this meaning, and writers on arithmetic use it freely. There seems to be no word to take its place. Indeed, many teachers who say they object to it, use it freely in their daily work.

Page 81

Review and Drill. Adding two-figure numbers with carrying; no sum as great as 100. Serial adding.

Page 82

New Matter. The decimal system from 100 to 1000.

Supplementary Matter. Bundles of sticks may be brought in to show hundreds, tens, and ones. Other numbers besides those given in the text may be introduced under examples 1 and 4.

Remarks. At this time, mention again **ones'** place and **tens'** place, and then talk about all four places together; that is about **ones', tens', hundreds'** and **thousands'** places.

Page 83

New Matter. Writing numbers. Uses of large numbers.

Supplementary Matter. Let the children bring in large numbers which they have actually seen in use. Let them read these numbers and write them.

Remarks. Make no special effort to image large numbers. This we do not need to do. It is quite enough that the child knows that 1000 is equal to 10 times 100, and that he knows which of two large numbers is the greater, and so on. Whatever the talk may be about actually **understanding** large numbers, none of us image such numbers as 1000, or perhaps even 500. We simply know their relations to other numbers.

If very large numbers should be brought in by the children, their consideration may be postponed.

Pages 84 and 85

New Matter. Adding three-place numbers.

Remarks. Note that the first of the examples worked out in the text has no carrying. The second has carrying of tens but not of hundreds; the third has carrying of hundreds and not of tens, and the fourth has carrying of both tens and hundreds. A fundamental maxim is, "One difficulty at a time."

Put the first example on the board and point out that ones are added, then tens, and then hundreds. It is just as well not to try to explain the carrying of hundreds at this point. Show which figures of the sum to carry. The carrying of tens was explained in adding 28 and 35, on page 80. We now proceed by analogy to carry hundreds. The explanation will come later. The purpose here is to learn and then to habituate the operation.

Page 86

New Matter. Writing numbers representing dollars and cents; adding such numbers.

Remarks. Make no attempt to explain decimals at this point. The child will have no difficulty in writing numbers of the kind given on this page, provided the difficulties are not brought to him by the teacher. Nor will he have any difficulty in adding these numbers. The great majority of grown-up people who handle such numbers readily do not think about tenths' place, hundredths' place, and so on.

Page 87

Applications. Saving money to buy Christmas presents.

Supplementary Material. Let the children bring in stories about money to be spent for Christmas presents, what presents they will buy, the amount which each present will cost, the total amount, and so on. Make sure that the prices are reasonable and that the things that they finally decide to buy are fairly sensible.

Page 88

Application. Selling newspapers.

Supplementary Matter. Have the boys bring in data about selling papers in your own town (if the school is in the city).

Remarks. The prices that are charged for papers, and the conditions under which they are sold, vary a great deal in the various parts of the United States. Do not let the child get the idea that the page is not practical, even if it does not represent conditions in his own town. That is an idea that provincial people are always quick to get.

Page 89

Review and Drill. Serial addition.

Remarks. Bring out the difficulty of counting all the children in a large school, and the value of addition as shown by the greater ease with which the total number can be obtained by counting the number in each room and then adding. Have the children suggest other situations where addition is used in this way. One might suggest the finding of the number of people in a city, where the number in different parts are counted, and the sums added.

Page 90

Review and Drill. Serial addition. Adding three-figure numbers.

Page 91

New Matter. A number game.

Review and Drill. Adding three-figure numbers.

Supplementary Matter; Drill in Fundamentals. For a game like the one described on this page have the children add the last two rows of examples on page 84.

In drills where material in the book is used, paper should be prepared with a view to save copying. Have children write their names at the top of the sheets, then fold under a strip with the name on it, then fold under another strip, etc. The result will be a sheet with parallel creases. When a row of answers has been obtained on one of these strips it is folded under so the edge may again be placed directly below the example to be worked. Get everything ready for the race, explain just what is to be done, and then as a signal for the race to start tell what examples are to be worked.

Remarks. The game described on this page is one of the most effective number games. It keeps all the children busy all the time. There is a definite penalty for errors, so that the main effort will be to attain accuracy. It brings definitely into play group rivalry. If the same teams are made to play successive games extending over a considerable period, each pupil becomes responsible to his team and the members of the team will become interested in him. In most parts of the country the cross-country race is well known.

Page 92

New Matter. Subtracting two and three-figure numbers. No carrying (or borrowing).

Remarks. It will be noted that the two standard methods of subtraction are given equal prominence on this page. Select the one which has already been adopted for use in your school, and omit the other completely. (See notes to page 17.) Make no great effort to explain the process. Simply subtract ones from ones, tens from tens, hundreds from hundreds, etc.

Page 93

Applications. Finding differences of ages.

Remarks. The purpose of this page is to learn to recognize situations which demand subtraction. The finding of the difference between two numbers; or, finding how much more one number is than another; how much less one number is than another; how much must be added to one number to make the sum equal to another—all such situations are to be connected with the process of subtraction. The teacher may well ask many more questions at this point, involving problems of the kind suggested here, and then ask the children how the problems may be solved. The children may also be asked to make up problems which require subtractions for their solution.

The answer to the question, "How do you find out?" should be, "subtract," not "take away." We want to connect the situation with the process by means of the formal word.

Page 95

Applications. Making Christmas candy.

Supplementary Matter. If any of the children of the class are making Christmas candy, have them bring in as many actual data about candy making as they can. Get real local prices.

Drill in Fundamentals. Play the game on page 91, using the 3 rows of subtraction problems on page 92. Prepare papers as suggested in the notes to page 91.

Pages 96 and 97

Applications. Buying Christmas presents.

Supplementary Matter. Plan buying Christmas presents. Have each child write out a list of what he would like to buy. Reject these lists unless they are made neatly. This is a good way to motivate writing. Let the children tell how they earned the money, and also how they saved it.

Drill in Fundamentals. Play the game on page 91, using the examples on page 80.

Page 98

New Matter. The word **quotient;** the division sign.

Review and Drill. The table of 2's; $\frac{1}{2}$ of 8 and $\frac{1}{4}$ of 8 derived from $2\times4=8$, etc.

Remarks. See to it that the child gets $\frac{1}{2}$ of 18, and also $\frac{1}{9}$ of 18, from the combination $2\times9=18$, and similar combinations from the other multiplication facts which he learns.

Page 99

New Matter. The "New Number Facts."

Review and Drill. The table of 3's. Also, $5\times3=3\times5$, and so on.

Supplementary Matter. On the board write the following addition examples:

								3
							3	3
						3	3	3
					3	3	3	3
				3	3	3	3	3
			3	3	3	3	3	3
		3	3	3	3	3	3	3
	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3
6	9	12	15	18	21	24	27	30

Also write:	1	2	3	4	5	6	7	8	9	10
	1	2	3	4	5	6	7	8	9	10
	1	2	3	4	5	6	7	8	9	10
	3	6	9	12	15	18	21	24	27	30

Read the first set $2\times3=6$, $3\times3=9$, $4\times3=12$, etc., and the second set $3\times1=3$, $3\times2=6$, $3\times3=9$, $4\times3=12$, etc.

From the first set we see that $\frac{1}{2}$ of $6=3$; $\frac{1}{3}$ of $9=3$, etc., and from the second set we see that $\frac{1}{3}$ of $3=1$, $\frac{1}{3}$ of $6=2$, etc.

Drill in Fundamentals. For the game on this page show flash cards and say, "Multiply."

Page 100

Review and Drill. The table of 3's, and related number facts.

Supplementary Matter. Use such questions as the following: If we eat three meals a day, how many meals will we eat in a certain number of days? How many leaves are there on so many three-leaf clovers? How many wheels are there on so many tricycles? How many tricycles have altogether 24 wheels? How many eggs in so many hands of eggs? (The grocer counts eggs by taking three in each hand. Hence three eggs are sometimes called a "hand" of eggs. Use this only in case it is a local custom.)

Have the children find out what can be bought for three cents, and then ask questions based on this.

Page 101

New Matter. The "New Number Facts." The number facts related to the combination in the table of 4's.

Review and Drill. The tables of 2's and 3's.

Supplementary Matter. Base questions on such facts as: An animal has four legs; an automobile has four wheels; a horse has four shoes; four quarters make one dollar. There are four panes of glass in a certain window; four corners of a desk; four sides of a square or rectangle. See if the children can give other examples where 4 occurs naturally.

Page 103

New Matter. A number game.

Remarks. This game is good for the purpose of quickening the attention. Let the children make the cards, by cutting out the paper and writing the numbers on them. Accept no card unless it is well made. The stimulus for neat and careful work which lies in this cannot easily be overestimated.

Pages 104 and 105

New Matter. The liquid gallon.

Review and Drill. The quart and the pint.

Supplementary Matter; Drill in Fundamentals. At the end of page 104 play the game on page 91, using the examples in the first three rows on page 85. Let children work from the book without copying. Prepare papers as suggested in notes to page 91.

Remarks. Under example 9, page 104, have children name all the objects they can think of that are measured by the gallon in their neighborhood; a gallon of kerosene, a gallon of oil for the auto, a gallon of molasses, a gallon of cooking oil, and so on. The city child is not likely to have had any experience with the gallon of kerosene.

Page 106

Review and Drill. The table of 5's.

Applications. Table of 5's applied to the number of school days in the week; the number of cents in a nickel; the selling of papers for five cents.

Supplementary Matter. Bring in other uses of 5's. Find out what things are sold locally for five cents; count the minutes on the clock face, pointing to the number 1, saying "five," the number 2, saying "ten," and so on.

Drill in Fundamentals. Play the game on page 91, using last three rows of examples on page 85. Do not have children copy the examples. See notes to page 91.

Page 107

Applications. The tables of 3's, 4's and 5's applied to the selling of fruit. Let the children make other questions on this topic.

Supplementary Matter; Drill in Fundamentals. Play the game on page 91, using the examples in subtraction on page 92.

Page 108

Review and Drill. Add 6 and 7 by endings. Adding columns. Counting by 6's and 7's.

Supplementary Matter; Drill in Fundamentals. Play the game on page 91, using the first two rows of examples on page 90.

Page 109

New Matter. A special device for adding 8's and 9's.

Remarks. Ask, for example: 45 plus 9 equals what? See to it that the child gets the answer by increasing the number in tens' place by one, and decreasing the number in ones' place by one. Also point out that 5 and 9 can be added in this way.

Question: 57 plus 8 equals what? See to it that the child gets the answer by increasing the number in tens' place by one, and decreasing the number in one's place by two. Again, point out that 7 and 8 can be added in this way.

By this device the children are helped materially to remember some of the most difficult fundamental addition facts.

Page 110

New Matter. Reading and writing large numbers.

Remarks. Ask about further uses of large numbers. Also have the pupils count from 100 to 1000 by hundreds; from 1000 to 10,000 by thousands; and possibly higher. The children like counting, and it helps in bringing home to them the meaning of large numbers.

Supplementary Matter; Drill in Fundamentals. Play a game, using the three rows of examples in subtraction on page 92. Let one side of the room play against the other.

Page 111

New Matter. Practical uses of large numbers.

Remarks. Do not try to understand large numbers in the sense of imaging them. However, questions may be asked which will bring out that 4000 is twice 2000; 8000 is four times 2000, and so on.

Supplementary Matter. Have the child bring in as many other practical uses of large numbers as he can find.

Drill in Fundamentals. Play a game on addition, using the last two rows of examples on page 90. Let one side of the room play against the other.

Page 112

Review. Making change.

Remarks. Read again the notes to page 16. As in earlier work, let the children make "play" money and use that, and have them make actual change in the way that the storekeeper makes change, using this "play" money.

Page 113

New Matter. The words subtrahend and minuend. Subtraction, using carrying, or borrowing, in one's place.

Remarks. Use the method already familiar to the pupil. If the addition method is used, be sure to say, 13 equals 6 plus 7, not 6 plus 7 equals 13. We start with 13, the sum, then give one of the addends, and finally find the unknown number.

Note that in the following pages one single difficulty in subtraction is introduced at a time. In explaining the subtraction process, the form given on page 331 may be used if the teacher thinks best. We need have no fear that the child will have difficulty in passing to the shorter process. The law of taking the line of least resistance will take care of that.

Explanation, using first method.

Since we cannot add any number to 6 to make 3, we add 10 to both minuend and subtrahend and arrange the work (for purposes of explanation) thus:

$$\begin{array}{rcr} 83+10 & = & 80+13 \\ 36+10 & = & \underline{40+\ 6} \\ & & 40+\ 7. \end{array}$$

We then say, 13=6+7; 80=40+40, or 8 tens=4 tens+4 tens. For short we simply say, 8=4+4.

Explanation, using second method:

Since we cannot subtract 6 from 3, we change 83 to 70+13, writing the work as follows:

$$\begin{array}{rcr} 83 & = & 70+13 \\ 36 & = & \underline{30+\ 6} \end{array}$$

We now subtract as usual. In this process we say we **borrow** 1 (one ten) from the 8 (tens).

Page 114

New Matter. Subtraction with a zero in the first place in the minuend; also subtraction with carrying or borrowing in two places.

Remarks. The following explanation may be used by the teacher if she thinks best.

Example 1. **First method.**

$$\begin{array}{rcr} 90+10 & = & 90+10 \\ 43+10 & = & \underline{50+\ 3} \\ & & 40+\ 7=47 \end{array}$$

Ten is added to both minuend and subtrahend. In the minuend the 10 is added to the ones, and in the subtrahend it is added to the tens.

$$\left.\begin{array}{rcr} 90 & = & 80+10 \\ 43 & = & \underline{40+\ 3} \\ & & 40+\ 7 \end{array}\right\} \textbf{Second method.}$$

Example 2. **First method.**

$$\begin{array}{rcr} 631+100+10 & = & 600+130+11 \\ 246+100+10 & = & \underline{300+\ 50+\ 6} \\ & & 300+\ 80+\ 5 \end{array}$$

100–10 is added to both minuend and subtrahend.

Note how they are added in each.

$$\left.\begin{array}{rcr} 631 & = & 500+120+11 \\ 246 & = & \underline{200+\ 40+\ 6} \\ & & 300+\ 80+\ 5 \end{array}\right\} \textbf{Second method.}$$

Supplementary Matter; Drill in Fundamentals. Play a game in addition, using the first two rows on page 108. Let one side of the room play against the other.

Page 115

New Matter. Subtraction where one or more zeros occur to the left in the remainder, these zeros being omitted and the reasons given for omitting them.

Remark. The new difficulty on this page should be brought out clearly. If necessary make other examples like the one given in the middle of the page.

The example solved on this page may be explained in the same manner as those of the preceding pages.

First method.	Second method.
$1283+10=1200+80+13$	$1283=1200+70+13$
$1227+10=\underline{1200+30+\ \ 7}$	$1227=\underline{1200+20+\ \ 7}$
$0+50+\ \ 6=56$	$50+\ \ 6=56$

Page 116

New Matter. Subtraction with one zero in the subtrahend, this zero not being in the ones' place. Test of subtraction.

Remarks. After the test has been introduced the child should be required to test all his examples. In practical computation all the work is tested. It is estimated that in an engineer's computing room two-thirds of the time used in computing is occupied with finding the results, and one-third of the time is used in checking the results.

Page 117

New Matter. Subtraction. Zeros in the minuend.

Supplementary Matter. Before taking up the work on this page, it may be well to introduce subtraction problems with only one zero in the minuend, this zero not being in one's place (see page 114). In that case use the following:

Example. From 4306 subtract 2153.

4306	**Ones**	$6=3+3$	Write 3.
$\underline{2153}$	**Tens**	$10=5+5$	Write 5.
2153	**Hundreds**	$3=2+1$	Write 1.
	Thousands	$4=2+2$	Write 2.

The following exercises may then be copied on the board:

1. $\begin{array}{r}8026\\ \underline{3413}\end{array}$	2. $\begin{array}{r}1503\\ \underline{242}\end{array}$	3. $\begin{array}{r}5406\\ \underline{3562}\end{array}$	4. $\begin{array}{r}18021\\ \underline{3810}\end{array}$	5. $\begin{array}{r}3902\\ \underline{2724}\end{array}$	6. $\begin{array}{r}6908\\ \underline{3493}\end{array}$
7. $\begin{array}{r}7093\\ \underline{4736}\end{array}$	8. $\begin{array}{r}8012\\ \underline{3641}\end{array}$	9. $\begin{array}{r}5509\\ \underline{2734}\end{array}$	10. $\begin{array}{r}9402\\ \underline{6276}\end{array}$	11. $\begin{array}{r}1109\\ \underline{247}\end{array}$	12. $\begin{array}{r}5034\\ \underline{2647}\end{array}$

Drill in Fundamentals. At the end of the page, play game on page 91, using examples in subtraction on page 115.

Pages 118 and 119

Applications. Subtraction used in finding ages and net weights.

Supplementary Matter. Find the ages of other well known men at the time of their death. Let the children suggest names of such men.

Drill in Fundamentals. At the end of the page play the game on page 91, using the examples in subtraction on page 116.

Page 120

New Matter. Drawing to scale.

Remarks. The subject of drawing to scale may be introduced as follows: Measure the length and width of the top of a desk in inches and then draw a picture of it on the board, exactly the same size as the top of the desk.

Measure the length of a certain line on the floor, and then draw a picture of it on the board, making the picture the same length as the original line.

Question: Can we represent the length of the schoolroom in this way? Clearly, we cannot.

Draw a line on the board one foot long. If this line represents a yard, then one foot of the picture represents three feet of the line. We then say that we have drawn the line to the scale one-third.

Measure the length of another line in feet. Make a drawing on the board, letting one inch represent a foot, and so on.

After preliminary work of this kind, the child is set to work on the page.

Page 121

New Matter. Definition of a rectangle, and formal work on the area of the rectangle.

Supplementary Matter. Ask the children to find the number of inch squares of candy in pans of several sizes, all being within the tables already studied.

Drill in Fundamentals. Play the game on page 91, using the examples in the last two rows of page 90.

Pages 122 and 123

New Matter. The "New Number Facts."

Supplementary Matter. Write on the board the following

$$\begin{array}{ccccccccc}
 & & & & & & & & 6 \\
 & & & & & & & 6 & 6 \\
 & & & & & & 6 & 6 & 6 \\
 & & & & & 6 & 6 & 6 & 6 \\
 & & & & 6 & 6 & 6 & 6 & 6 \\
 & & & 6 & 6 & 6 & 6 & 6 & 6 \\
 & & 6 & 6 & 6 & 6 & 6 & 6 & 6 \\
 & 6 & 6 & 6 & 6 & 6 & 6 & 6 & 6 \\
6 & 6 & 6 & 6 & 6 & 6 & 6 & 6 & 6 \\
6 & 6 & 6 & 6 & 6 & 6 & 6 & 6 & 6 \\
\hline
12 & 18 & 24 & 30 & 36 & 42 & 48 & 54 & 60
\end{array}$$

From these it is easily seen that $\frac{1}{2}$ of $12=6$, $\frac{1}{3}$ of $18=6$, etc. Also write on the board:

$$\begin{array}{cccccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
\hline
6 & 12 & 18 & 24 & 30 & 36 & 42 & 48 & 54 & 60
\end{array}$$

From these, show that $\frac{1}{6}$ of $6=1$, $\frac{1}{6}$ of $12=2$, and so on.

Page 124

Review and Drill. The ordinary process of subtraction.

Drill in Fundamentals. Play the game on page 91, using the first 20 examples on page 117.

Page 125

Applications. Buying outfits for coasting.

Remarks. Do not ask children to "analyze" these problems. In solving Example 4, use the following form of solution:

$$\begin{array}{rl} \$1.40 & \text{(add)} \\ 1.90 & \\ .25 & \\ \hline \$3.55 & \end{array} \qquad \begin{array}{rl} \$5.00 & \text{(subtract)} \\ 3.55 & \\ \hline \$1.45 & \end{array}$$

If the child selects the proper operation, that shows that he knows what to do, and that, after all, is the essential purpose of the so-called analysis.

Supplementary Matter. In connection with example 6, bring in local prices of certain articles and have children make problems based on them, and then have them solve these problems, putting the work in neat written form.

Page 126

New Matter. Multiplication of a two-figure number by a one-figure number.

Remarks. The multiplication of numbers of this kind has been postponed because earlier it was not possible to show the elements in common between addition and multiplication. It is only after the child has learned to carry in addition that he can handle successfully this kind of work in multiplication. As a preliminary form, problems of this sort may be worked as follows and then the simpler form put down next to it.

$$\begin{array}{r} 36 \\ 4 \\ \hline 24 \\ 120 \\ \hline 144 \end{array} \qquad \begin{array}{r} 36 \\ 4 \\ \hline 144 \end{array}$$

Page 127

New Matter. Multiplication of numbers representing money.

Application. Miscellaneous problems.

Remarks. Read again the note to page 86.

Supplementary Matter; Drill in Fundamentals. Work the last two rows of examples on page 108. Let the girls play against the boys.

Page 128

Application. The buying of valentines.

Remarks. The multiplication used here is within the tables already learned.

Page 129

Applications. The buying of groceries.

Remarks. Some problems on this page can be solved by direct application of the multiplication tables, while others require long multiplication. The purpose of this is, to bring home to the child that long multiplication attains the same purpose as the use of the multiplication table in case the numbers are small enough.

On this page there are some problems requiring addition and some subtraction. The teacher should be fully aware of the essential difficulty of picking out the operation to be used in each problem. In the earlier parts of the book we have groups of problems solved by addition, and other groups by subtraction; then others by multiplication. In each of these groups the child has no great difficulty in picking out the right operation, but now when such problems occur miscellaneously, the real difficulty occurs. Have the children make up many different problems, and state what operations they will use in solving them.

Supplementary Matter; Drill in Fundamentals. Add all the examples on page 90; let the girls play against the boys.

Page 130

New Matter. The "New Number Facts."

Supplementary Matter. Find what things are sold at seven dollars or seven cents per unit. Thus, it may be that hard coal is sold at $7.00 a ton, and in some locations possible soft coal is sold at that rate. Also, there will be certain objects the price of which is 7¢ per unit.

Write on the board a column of 2 sevens, one of 3 sevens, one of 4 sevens, and so on, and add them. Then point out that $\frac{1}{2}$ of $14 = 7$, $\frac{1}{3}$ of $21 = 7$, and so on. See notes to page 122.

Write on the board a column of 7 ones, 7 twos, and so on, and add them. From this show that $\frac{1}{7}$ of $7 = 1$, $\frac{1}{7}$ of $14 = 2$, and so on.

Now have the child show $\frac{1}{7}$ of 7, $\frac{1}{7}$ of 14, and so on.

Page 131

Applications. The milk supply. Using the table of 7's.

Remarks. On this page some problems must be solved by long multiplication, while others can be solved by direct application of tables. Note again the remarks in the notes to page 129.

Page 132

Review and Drill. Addition, Subtraction, Multiplication.

Page 133

Review and Drill. Number facts related to each fact in the multiplication table.

Remarks. Of the multiplication facts already learned, the following are generally regarded as the most difficult: 9 × 8, 9 × 7, 9 × 6, 9 × 9, 7 × 6, 9 × 4, 9 × 3, 8 × 7, 7 × 3, 8 × 6, 8 × 4, 8 × 3, 9 × 5, 7 × 4, 7 × 7. See notes to page 54.

No attempt has been made here to place these in order of difficulty as among themselves.

Page 134

Review and Drill. Addition combinations. Serial addition, of 7, 8, and 9. Long subtraction.

Page 135

Review and Drill. The multiplication tables and the related division combinations. Long multiplication.

Page 136

New Matter. The "New Number Facts."

Supplementary Matter. Write this table in the addition form as suggested in the notes to page 122 for the table of 6's.

Page 137

Review and Drill. Finding factors of products within the tables.

Remarks. For the game suggested on this page, use the following products: 30, 14, 9, 72, 63, 49, 45, 35, 56, 64, 48, 21, 28, 42.

Pages 138 and 139

New Matter. Dry measure. The quart, the peck, and the bushel.

Supplementary Matter; Drill in Fundamentals. Play the game on page 91, using the examples in addition on page 132.

Arrange teams as suggested on page 91, and let the same teams play together in the games suggested in the notes to page 141.

Remarks. The quart, peck, and bushel measures are brought in as applications of the table of 8's. Discuss thoroughly what objects are measured by the dry quart, the peck, and the bushel. Learning the uses of these measures is an essential part of the course in arithmetic, and is not merely brought in as illustrative material. To get acquainted with the peck and the bushel, sawdust may be used, as suggested on the page, or the children may be sent to the sand pile. The resourceful teacher will find some way of bringing these facts thoroughly home to the children through their own personal experience.

Page 140

Applications. Buying a camera. Counting money in dimes.

Supplementary Matter. Ask each child to make up a story about securing a certain number of dimes with which to make a purchase. Have him tell his story, and let the class criticise it, and in particular state whether or not his number work is correct.

Remarks. This page is taken from an actual experience of an eight-year-old boy.

Page 141

Applications. Paying carfare.

Supplementary Matter. Under example 9, get the children to make real problems on paying carfare.

Drill in Fundamentals. Play the game on page 91, using the examples in multiplication at the bottom of page 136.

Page 142

Applications. Miscellaneous problems, involving the tables.

Supplementary Matter. Ask each child to make two problems like these. Then have the children read their problems and give the answers.

Page 143

Applications. A boy's garden.

Supplementary Matter. If possible, bring in actual data from a garden kept by a boy. It may be that these data will materialise slowly, as the boy's garden work progresses. This is as it should be. Let us leave the boy to get the facts as they come before him. This is the way things are done in real life. We must not only teach arithmetic, but also develop in the children the habit of using it as it is actually used in the work-a-day world.

Page 144

New Matter. The "New Number Facts."

Supplementary Matter. Write columns of 9's; two in the first column, three in the second, four in the third, and so on, and add these columns. From these examples, show that $\frac{1}{2}$ of 18 is 9, $\frac{1}{3}$ of 27 is 9, and so on.

Put on the board a column of nine 1's, a column of nine 2's, and so on, and add them. (See note to page 122). From the first column show that $\frac{1}{9}$ of 9 is 1; from the second, that $\frac{1}{9}$ of 18 is 2, and so on. These facts should, of course, be developed by the asking of questions.

The children have now studied the most essential part of the multiplication table. It is suggested that a series of drill games be arranged covering these tables. Have the children prepare a sheet as suggested in the notes to page 71 for recording their errors. The suggestion in the notes to page 71 for giving drills may be followed here. An error in $\frac{1}{6}$ of 42, $\frac{1}{7}$ of 42, $42 \div 6$, $42 \div 7$, should be recorded under the combination 6×7.

In the groups of combinations given here the easier ones occur at least 4 times while the more difficult ones occur in nearly every group. For about one-half of the drills use flash cards as on page 19, and for the other half read combinations as on page 71.

First drill in multiplication combinations.

6	2	5	1	8	8	4	9	4	3	9	6	2	7	3	5	7	3	3	6	4
6	4	6	4	7	1	7	9	8	9	8	7	8	9	4	8	7	9	7	8	5

Second drill in multiplication combinations.

9	9	7	8	6	6	6	5	5	5	4	4	4	3	3	3	2	2	1	1
9	8	9	7	9	8	7	9	7	5	8	7	5	8	6	4	8	4	8	4

Third drill in multiplication combinations.

9	7	6	6	5	4	4	3	2	1	1	9	8	6	5	5	4	3	3	2
9	9	9	7	7	8	4	6	7	7	3	8	7	8	9	2	6	8	4	3

Fourth drill in multiplication combinations.

5	4	4	4	4	3	3	3	2	2	1	1	9	8	7	8	6	6	6	5
7	9	8	6	4	8	6	4	7	3	7	3	9	8	9	7	9	8	7	9

Fifth drill in multiplication combinations.

1	2	3	3	1	2	3	4	4	4	5	6	4	5	6	6	9	8	7	8
2	2	3	8	6	6	6	4	6	9	9	8	8	7	7	9	8	8	9	7

Sixth drill in multiplication combinations.

5	4	4	4	3	3	3	3	2	2	1	1	9	8	7	7	6	6	6	5
6	9	7	6	9	7	5	3	6	2	6	2	8	8	9	7	9	8	6	8

Seventh drill in multiplication combinations.

1	1	1	2	2	3	3	3	4	4	4	5	5	6	6	6	7	8	8	9
1	5	9	5	9	5	7	9	6	7	9	6	8	6	7	9	7	7	8	8

Eighth drill in multiplication combinations.

5	5	6	6	6	7	8	7	9	4	4	4	3	3	3	2	2	1	1	1
6	8	6	7	9	7	7	9	8	9	7	5	9	7	5	9	5	9	5	1

First drill in division combinations.

1)2, 1)6, 2)4, 2)8, 2)12, 2)16, 4)12, 6)18, 8)24, 4)16,
4)24, 4)32, 6)30, 8)40, 6)36, 6)48, 8)56, 8)64, 2)2, 6)6,

Second drill in division combinations.

3)3, 7)7, 2)6, 5)10, 7)14, 9)18, 3)12, 3)18, 3)24, 5)20,
7)28, 9)36, 5)30, 5)40, 7)42, 9)54, 7)56, 9)72, 1)3, 1)7,

Third drill in division combinations.

4)4, 8)8, 3)6, 2)10, 2)14, 2)18, 5)15, 7)21, 9)27, 4)20,
4)28, 4)36, 7)35, 9)45, 6)42, 6)54, 9)63, 8)72, 1)4, 1)8.

Fourth drill in division combinations.

5)5, 9)9, 4)8, 6)12, 8)16, 3)9, 5)15, 3)21, 3)27, 6)24,
8)32, 5)25, 5)35, 5)45, 8)48, 7)49, 7)63, 9)81, 1)5, 1)9.

First drill in fractions.

$\frac{1}{2}$ of 4, $\frac{1}{4}$ of 8, $\frac{1}{6}$ of 12, $\frac{1}{8}$ of 16, $\frac{1}{3}$ of 12, $\frac{1}{3}$ of 18, $\frac{1}{3}$ of 24, $\frac{1}{4}$ of 16, $\frac{1}{6}$ of 24, $\frac{1}{8}$ of 32, $\frac{1}{5}$ of 30, $\frac{1}{5}$ of 40, $\frac{1}{6}$ of 36, $\frac{1}{8}$ of 48, $\frac{1}{7}$ of 56, $\frac{1}{8}$ of 64, $\frac{1}{2}$ of 2, $\frac{1}{6}$ of 6, $\frac{1}{7}$ of 42, $\frac{1}{9}$ of 54.

Second drill in fractions.

$\frac{1}{3}$ of 6, $\frac{1}{2}$ of 10, $\frac{1}{2}$ of 14, $\frac{1}{2}$ of 18, $\frac{1}{4}$ of 12, $\frac{1}{6}$ of 18, $\frac{1}{8}$ of 24, $\frac{1}{4}$ of 20, $\frac{1}{4}$ of 28, $\frac{1}{4}$ of 36, $\frac{1}{6}$ of 30, $\frac{1}{8}$ of 40, $\frac{1}{6}$ of 42, $\frac{1}{6}$ of 54, $\frac{1}{8}$ of 56, $\frac{1}{8}$ of 72, $\frac{1}{3}$ of 3, $\frac{1}{7}$ of 7, $\frac{1}{8}$ of 56, $\frac{1}{7}$ of 35.

Third drill in fractions.

$\frac{1}{2}$ of 6, $\frac{1}{5}$ of 10, $\frac{1}{7}$ of 14, $\frac{1}{9}$ of 18, $\frac{1}{3}$ of 15, $\frac{1}{3}$ of 21, $\frac{1}{3}$ of 27, $\frac{1}{5}$ of 20, $\frac{1}{7}$ of 28, $\frac{1}{9}$ of 36, $\frac{1}{5}$ of 35, $\frac{1}{5}$ of 45, $\frac{1}{7}$ of 42, $\frac{1}{9}$ of 54, $\frac{1}{7}$ of 63, $\frac{1}{9}$ of 72, $\frac{1}{4}$ of 4, $\frac{1}{8}$ of 8, $\frac{1}{9}$ of 72, $\frac{1}{6}$ of 48.

Fourth drill in fractions.

$\frac{1}{2}$ of 8, $\frac{1}{2}$ of 12, $\frac{1}{2}$ of 16, $\frac{1}{3}$ of 9, $\frac{1}{5}$ of 15, $\frac{1}{7}$ of 21, $\frac{1}{9}$ of 27, $\frac{1}{4}$ of 24, $\frac{1}{4}$ of 32, $\frac{1}{5}$ of 25, $\frac{1}{7}$ of 35, $\frac{1}{9}$ of 45, $\frac{1}{6}$ of 48, $\frac{1}{7}$ of 49, $\frac{1}{9}$ of 63, $\frac{1}{9}$ of 81, $\frac{1}{5}$ of 5, $\frac{1}{9}$ of 9, $\frac{1}{7}$ of 63, $\frac{1}{7}$ of 28.

Page 145

New Matter. The square foot and the square yard.

Review and Drill. The table of 9's.

Applications. Areas measured in square feet and in square yards.

Page 146

New Matter. Multiplication, like 6×847.

Review and Drill. Ordinary multiplication with one figure in the multiplier.

Page 147

Review and Drill. The multiplication table with division within the table. Long multiplication.

Page 148

New Matter. Multiplication with two-figure multipliers, as, 26×34; 39×87.

Remarks. In introducing long multiplication, the solution may be written out as shown on the opposite page.

The left form shows the nature of the process, while the form to the right is the contracted form used in practice. The child will have no trouble in passing from the long to the short form.

First form	Second form	Final form
34	34	34
26	26	26
6× 4= 24	6×34=204	204
6×30=180	20×34=680	68
20× 4= 80	884	884
20×30=600		
884		

Page 149

New Matter. Multiplication with a zero in the multiplicand not in the first place to the right, such as, 9×307, and 29×307.

Remarks. In this page also, use the long form first:

First form	Final form	First form		Final form
307	307	307	307	307
9	9	29	29	29
9× 7= 63	2763	9× 7= 63	2763	2763
9×300=2700		9×300=2700	6140	614
2763		20× 7= 140	8903	8903
		20×300=6000		
		8903		

Page 150

New Matter. The "New Number Facts." Multiplication by 10.

Supplementary Matter; Drill in Fundamentals. Play the game on page 91, using the first ten examples on page 149.

Select teams as suggested on page 91. Let these teams play the games suggested in the notes to pages 153, 154, 155, 157, 159.

Page 151

New Matter. Multiplication by 20, 30, and so on.

Remarks. The multiplication by 20, 30, and so on, is, of course, preliminary to the multiplication of two or three figure numbers.

Page 152

New Matter. Multiplication, the multiplicand or multiplier, or both, having one or more zeros in the first place to the right. It is often customary among business people to write down such problems in a special way, as:

$$\begin{array}{r} 228 \\ \underline{160} \end{array} \qquad \begin{array}{r} 480 \\ \underline{240} \end{array} \qquad \begin{array}{r} 6800 \\ \underline{370} \end{array}$$

The multiplication is thus carried out exactly as if there were no zeros to the right and the proper number of zeros annexed in the product. Thus, to multiply 6800 by 370, we may multiply 68 by 37 and then annex three zeros to the right in the product. It may be interesting to show the children this short method.

Page 153

Review and Drill. Multiplication and addition.

Supplementary Matter; Drill in Fundamentals. Play the game on page 91, using the examples in subtraction on page 132. Use the same teams as in the game suggested for page 151.

Pages 154 and 155

Applications. Farm problems.

Remarks. If the children live in a city, a full discussion should be had of the various things which are mentioned in the problems on these pages. If the children are on the farm they will make problems to fit their experiences. In this case have problems brought in made entirely from local material.

Supplementary Matter. At the end of page 154 play the game of page 91, using the first ten examples in multiplication on page 149. For this game and the next one, use the same teams as in the games suggested for pages 150, 153.

At the end of pages 155 play the game on page 91, using the first sixteen examples in subtraction on page 124.

Page 156

New Matter. Multiplication. 406×387. Multiplication with a multiplier having a zero in the middle.

Remarks. The long form may also be shown to the children here.

Page 157

Review and Drill. The multiplication tables. Division within the tables.

Supplementary Matter; Drill in Fundamentals. Play the game on page 91, using the last ten examples on page 149.

Remarks. Note that 36 divided by 9, and 36 divided by 4, occur in order. After having read the combinations in this order, read by columns as well as by lines. Also read the columns upward. Read the lines backwards. This will provide a good deal of drill on this topic.

Pages 158 and 159

New Matter. The pound and the ounce.

Applications. The weight of children; weighing candy, meat, and so on.

Supplementary Matter. Let the children find as many things as they can that are sold by weight, the unit being the pound and the ounce. Have the children make many problems of the type given on these two pages.

Drill in Fundamentals. Play a number game, using the examples in addition on page 90. Do not copy the numbers to be added.

Page 160

Review and Drill. Addition, Subtraction, Multiplication.

Page 161

Review and Drill. The multiplication tables and related number facts.

Supplementary Matter. Play a number game, using the first ten examples in multiplication on page 153.

Pages 162 and 163

New Matter. The table of time.

Supplementary Matter. Have the children make many oral exercises based on your own school program.

Drill in Fundamentals. Play a game, using the examples in addition on page 160. In this game and the ones suggested in the notes to pages 167, 169, 170, let one side of the room play against the other.

Pages 164 and 165

New Matter. Division within the tables. Remainder.

Review and Drill. Long multiplication.

Remarks. The examples in division with remainder given on these pages are preparatory to short division and should be practiced from time to time with that end in view. See also page 173.

Pages 166 and 167

New Matter. Days, weeks, months, years.

Supplementary Matter; Drill in Fundamentals. At the end of page 166 play a game like the one on page 71. Use the following combinations:

$8\overline{)48}$, $7\overline{)56}$, $9\overline{)63}$, $7\overline{)42}$, $5\overline{)35}$, $4\overline{)28}$, $5\overline{)25}$, $8\overline{)56}$, $7\overline{)49}$, $5\overline{)45}$,
$9\overline{)54}$, $7\overline{)42}$, $6\overline{)54}$, $8\overline{)56}$, $9\overline{)81}$.

Have children make a set of cards of this kind.

Play a game, using the examples in multiplication on page 165.

Pages 168 and 169

Applications. A boy's garden.

Review and Drill. The area of a rectangle.

Supplementary Matter; Drill in Fundamentals. Play a game using the examples in addition on page 108.

Page 170

Review and Drill. The dozen, and parts of a dozen.

Supplementary Matter. Find what things are sold by the dozen.

Drill in Fundamentals. Play a game, using the examples in addition on page 160.

Page 171

Review and Drill. Addition and subtraction.

No standards for speed seem to be in existence for the third grade, and hence no time limit is put in here.

Supplementary Matter; Drill in Fundamentals. Play a game, using the examples in subtraction on page 134. Let the girls play against the boys.

Page 172

Review and Drill. Multiplication.

Supplementary Matter. Play a game, using the first ten examples in multiplication on page 149. Let the girls play against the boys.

Page 173

Review and Drill. Division within the tables. Remainders.

Applications. Miscellaneous problems.

Page 174

New Matter. Short division. No remainder. Problems such as, 1684 ÷ 2, where each digit in the dividend, except the first one or two, is a multiple of the divisor.

Supplementary Matter; Drill in Fundamentals. Play a game, using the examples in addition on page 171. Let the girls play against the boy.

Page 175

New Matter. Short division of the type 476 ÷ 2; 785 ÷ 5.

Page 176

Applications. General discussion of the solution of problems.

Remarks. Have children make several problems of each kind. Let each child read his problems and state how he would solve them.

Supplementary Matter; Drill in Fundamentals. Play a game, using examples 11–20, page 156. Let one side of the room play against the other.

Page 177

Applications. Problems without numbers. These problems are really among the most important in the whole arithmetic. The subject of arithmetic may be divided into two parts, one part consisting of the four fundamental operations, and the other part consisting in deciding when and how these operations are to be applied. We are now attacking the second part of arithmetic. See the statement about this on page 176 of the text.

It will be found that some children who learn number combinations easily and who perform the fundamental operations effectively find very great difficulty in solving problems. The child is now entering upon a new test of his abilities which the teacher should watch with care and interest.

Supplementary Matter; Drill in Fundamentals. Play a game, using the examples in addition on page 171. In this and the next four games let the girls play against the boys.

Page 178

Applications. Postage.

Supplementary Matter. Make problems involving payments for postage.

Drill in Fundamentals. Play a game using the examples in subtraction on page 171.

Page 179

Applications. Miscellaneous problems connected with the baseball nine.

Remarks. See note to page 125.

Supplementary Matter. Make problems from actual data which may be had from a real ball team operating in your section. The children will take great interest in getting such data, and the examples will seem much more alive to them than any that may be found on the page of the book.

Drill in Fundamentals. Play a game, using the examples in addition on page 90.

Page 180

Applications. Miscellaneous problems.

Remarks. Have the children read the page and tell how to solve each problem. Then let them solve the problems.

Supplementary Matter; Drill in Fundamentals. Play a game, using the examples in subtraction on page 160.

Page 181

Review and Drill. Miscellaneous material earned during the year.

Supplementary Matter; Drill in Fundamentals. Play a game, using examples 17 to 28 on page 172.

Page 182

Review and Drill. Addition, subtraction, multiplication.

Page 183

Remarks. In most schools this will mark the beginning of the fourth grade. The first step is to take an inventory of what the child knows. We begin with the 45 addition combinations. Let the children prepare blanks for recording errors like those suggested in the notes to page 71.

These ten drills should be given at the rate of one or possibly two each day, as soon as the grade gets fairly settled for work. Let the children exchange papers, and mark those that are wrong, as the teacher reads the correct answers in order. Then let each child record his errors. The children should understand that this work is simply to find out what combinations each child needs to study. Endeavor to have the children take an interest in their own progress. In the first five drills have the children write the sums in order on their paper without copying the numbers to be added. Tell the children to work as rapidly as they can, but let all finish. Remember that normal speed for one child may be only half speed for another. The ideal condition is attained when each child works at his best speed. Let the papers be turned down promptly when the work is finished.

First drill in addition: Write sums in rows 3–6, page 45.

Second drill in addition: Write sums in rows 2–5, page 54.

Third drill in addition: Write sums in rows 1–3, page 58.

Fourth drill in addition: Write sums in all but the last row on page 69.

Fifth drill in addition: Write sums in rows 1–4, page 134.

In the following five drills play the game on page 71. Let one side of the room play against the other.

Sixth drill in addition: Read the 6th drill in the notes to page 71 on page 318.

Seventh drill in addition: Read the 7th drill on page 318.

Eighth drill in addition: Read the 8th drill on page 318.

Ninth drill in addition: Read the 9th drill on page 318.

Tenth drill in addition: Read the 10th drill on page 318.

A child making more than one error in any one of these combinations should drill on it. Remember, however, that an error in a combination such as 5+1 or 3+3 is merely a **slip.** The child is sure to know better when his attention is called to it. There is no need of extended drill on such combinations.

Page 184

New Matter. Reading and writing large numbers.

Remarks. While no effort should be made to **image** the magnitude of large numbers, the child should be given practice in counting by thousands up to 10,000, and by ten thousands, and up to 100,000. The relative value of certain numbers may again be brought out, by questions such as: "20,000 is how many times 10,000?" and so on. That is about all the **understanding** that any of us have of large numbers.

Page 185

New Matter. Extension of Roman numerals.

Remarks. These numerals are used on the clock, in numbering chapters in books, and sometimes in giving dates, but this latter not very frequently. No great fuss should be made over the Roman numerals.

Supplementary Matter. Before taking up column addition on page 186, the ten drills described in the notes to page 183 should be finished. Then review serial addition on pages 72–76. This review may be partly by oral drill in reading the sums rapidly on these pages and also on pages 90, 94, 108, 134. The whole arithmetic period for several days may be taken up with these drills.

Games like the one on page 71 may be played, the teacher reading such combinations as,

$$\begin{array}{cccc} 8 & 28 & 37 & 42. \\ \underline{9} & \underline{9} & 6 & 9 \end{array}$$

Page 186

Review and Drill. Column addition.

Remarks. Do not copy these numbers. Simply add them, and write the results.

Page 187

Review and Drill. Addition. Writing numbers in columns. For the game suggested here, use the eight examples in addition suggested on page 182.

Page 188

Applications. Cash receipts.

Remarks. The remark at the bottom of the page in the text should be emphasized. There is still, and probably always will be, a large amount of adding done without the machine. We still need to learn to add and multiply, and we need to learn to write, though much writing is done on the typewriter. We even need to walk now and then, in spite of autos and aeroplanes.

Page 189

New Matter. Making out bills.

Review and Drill. Addition.

Supplementary Matter. Have the children bring in as many actual bills as they can find in their homes. Much drill can be had in extending these bills and in footing them.

Page 190

Applications. Distances between cities. All of these examples involve addition.

Page 191

Applications. The attendance at school.

Supplementary Matter. Get data from your own school and use them as the basis for problems of this kind.

Page 192

Review and Drill. Subtraction. Carrying, or borrowing.

Remarks. If the teacher thinks best she may use the following explanation. Most teachers prefer not to attempt an explanation here, but simply to habituate the process. If the explanation is given, the children should not be required to repeat it. The only purpose of an explanation at this stage is to make the children feel that there is a reasonable basis for the operation, and that when they are older they may see through it.

First Method.

$$\begin{array}{lcl}
3904+100+10 & = & 3000+900+100+14 \\
\underline{1247}+100+10 & = & \underline{1000+300+\ \ 50+\ \ 7} \\
2657 & & 2000+600+\ \ 50+\ \ 7=26507.
\end{array}$$

Add 100 + 10 to both minuend and subtrahend. In the minuend add to the tens and ones respectively, and in the subtrahend add to the hundreds and the tens.

Second Method.

$$\begin{array}{lcl}
3904 & = & 3000+800+90+14 \\
1247 & = & \underline{1000+200+40+\ \ 7} \\
 & & 2000+600+50+\ \ 7
\end{array}$$

Change 900 to 800+100 and 100 to 90+10. Add the 10 to 4.

Page 193

Applications. Miscellaneous problems involving both addition and subtraction. Read here again the note to page 177.

Page 194

Review and Drill. The multiplication tables. Multiplication by 20, 30, and so on.

Supplementary Matter; Drill in Fundamentals. Before taking up the study of multiplication again on page 194, run a series of drills, and games on the multiplication combinations similar to those on addition described in the notes to page 183. Let the children prepare blanks for recording errors exactly like those made for the addition combinations.

For the first five drills use numbers used in the first five addition drills, but tell the children to give products instead of sums. For drills 6 to 10 use the combinations proposed for the first five drills in the notes to page 144.

Conduct drills 6–10 the same as the corresponding drills on the addition combinations. See notes to page 183.

Page 195

New Matter. New number game.

Page 196

New Matter. Laundry bills.

Supplementary Matter. Have the children bring in laundry bills, and use these as the basis for problems.

Page 197

Review and Drill. Long multiplication. If the teacher thinks best, she may use the forms given below for the purpose of explanation. Most teachers prefer to omit such detailed explanations and simply habituate the form. (See note to page 192.)

$$\begin{array}{rr} & 846\\ & \underline{234}\\ 4\times846= & 3384\\ 30\times846= & 25380\\ 200\times846= & \underline{169200}\\ 234\times846= & 197964\end{array}$$

Explain why the zeros are omitted in practice.

Pages 198 and 199

New Matter. Making out sales checks.

Applications. Playing dry goods store.

Supplementary Matter. Have the children bring in sales checks received in a local store. Also see if you can get blank checks from some neighborhood store, and have the children fill them out. The regular printed form used in practice will lend interest to this work.

Page 200

Review and Drill. Number of days and weeks in a year.

Remarks. Have the child write dates on all papers that he hands in. Have a calendar in the room, and study each month, noticing the number of days and the number of weeks in it.

Page 201

Applications. Problems on saving money.

Supplementary Matter. Have the children tell again how they earn their money; how they save it; how much they saved in a week, in a month, and so on.

Drill in Fundamentals. For the first event in the game use the first three rows of examples on page 186; for the second event, examples 1 to 16 on page 192; and for the third event, examples 1 to 8 on page 197.

One of these events should be played on each of three consecutive days. Do not copy examples unless it is necessary.

Page 202

Applications. Buying fruit.

Supplementary Matter. Have children make up problems like these, using local data.

Page 203

Applications. Buying meat.

Supplementary Matter. Have children make problems like these, using local data.

Pages 204 and 205

New Matter. Extension of drawing to scale.

Remarks. Read again, note to page 120. Find a local map with a scale given on it, just to show that there is a scale given on maps.

Supplementary Matter; Drill in Fundamentals. For game on page 204, use examples in subtraction 1 to 15 inclusive on page 160.

Page 206

Review and Drill. Addition. Subtraction. Multiplication.

Supplementary Matter. For the first event in the game, use first column, page 161; for the second event, third column, page 161; and for the third event, use second column, page 161.

If in the judgment of the teacher, a smaller number of examples should be used for these games, she may do so.

Page 207

Applications. Miscellaneous problems.

Remarks. All except the last two of the problems on this page are one-step problems. The last two contain more than one step.

Page 208

New Matter. Definition of fractions. The use of the words numerator and denominator. Drawing lines and dividing them to show fractions.

Remarks. The illustrations should be simple, and as varied as possible. In every important fact in arithmetic, the generalization is made up from individual, concrete examples. For this reason there needs to be variety of illustrations. If variety is not used, the child will come to think of the number fact as representing one concrete thing. We are all familiar with the fact that in the beginning the child associates numbers with things in the same way that he associates names with things.

Supplementary Matter. Select teams as on page 91 to play the games suggested in the notes to pages 208, 213, 215. Play the game on page 91, using the last eight problems in multiplication on page 197.

Page 209

Review and Drill. Fractions within the multiplication table, including such combinations as $\frac{3}{5}$ of 20.

Page 210

Review and Drill. Addition and multiplication.

Supplementary Matter. For the race in addition, use examples 1 to 12 on page 90, and for the race in multiplication use examples 11 to 20 on page 149.

Page 211

Applications. Mixed problems.

Page 212

Review and Drill. Short Division. No remainder.

Page 213

New Matter. Short division, with remainders. Testing the results.

Supplementary Matter. Play the game on page 91, using the same teams as in the game for page 208. Use examples 9–16 inclusive on page 210. Have children copy examples and then multiply.

Page 214

New Matter. Averages. No remainder.

Page 215

Applications. Problems without numbers.

Remarks. Read again the notes to pages 176 and 177.

Supplementary Matter. Play the game of page 91, using the same teams as in the games for pages 208, 213. Copy and multiply exercises 17–24 inclusive on page 206.

Pages 216 and 217

Applications. A vegetable garden. The use of the scale in drawing. Finding areas.

Page 218

Review and Drill. Addition and subtraction.

Remarks. This page may be omitted if the teacher thinks best. It will be used several times later for speed tests and games.

Page 219

Review and Drill. Multiplication and short division.

Supplementary Matter. For the event in addition, use examples 1 to 8 on page 210; for the event in subtraction use examples 5 to 16 on page 206; and for the event in division use examples in the first 4 rows on page 213. For the events in multiplication use examples 13 to 20 on page 197.

Standard Tests in Speed and Accuracy.

During the last two decades many tests have been made by different investigators to ascertain the standard speed at which children in each grade can perform the fundamental operations of arithmetic. The speed tests suggested here are based on the general conclusions thus far obtained.

Some recent investigators have urged that effort be made to bring all the children up to the mean standard of speed, and that no effort be made to raise any child above that standard. This is certainly very questionable advice. It is believed that there is a speed at which each child does his best work. This speed may be called the optimum speed for that child. If he works below that speed he not only wastes time but is more liable to error, whereas if at this stage of development he tries to work at a higher speed he again makes a larger number of errors. Two children of the same age and of normal intelligence may have very different optimum speeds. If the policy is adopted of letting children with high optimum speeds work at the so-called standard speed, they will be left far below their optimum speed. In this way the child with a natural high speed may actually do less accurate work than the child whose optimum speed coincides with the standard speed. On the other hand, it is practically impossible to bring the naturally slow child up to standard speed.

These tests are so timed that, working at the standard speed, half of a normal class should finish correctly half or more of the work assigned.

(These tests are for pupils about the middle of grade four.)

First. Speed Test in Addition. Add examples on page 186. Time, 3 minutes. Before starting, have the children get ready as they do for a number game. See notes to page 91. Time the children carefully, seeing to it that all stop promptly and turn their answer paper down. In scoring, count the correct sums. According to the standards mentioned above, half of the class should have 20 or more correct answers.

Second Speed Test in Addition. Add examples 1–8 on page 210. Time, 3 minutes. Half of the class should finish correctly 4 or more examples.

Third Speed Test in Addition. Add examples 1–8 on page 218. Time, 4 minutes. Half of the class should finish correctly 4 or more examples.

First Speed Test in Subtraction. Examples 1–24, page 124. Time, 4 minutes. Half the class should finish correctly 12 or more examples.

Second Speed Test in Subtraction. Examples 1–20, page 192. Time, 3 minutes. Half the class should finish correctly 10 or more examples.

Third Speed Test in Subtraction. Examples 9–28, page 218. Time, 4 minutes. Half the class should finish correctly 10 or more examples.

First Speed Test in Multiplication. Examples 1 to 12, page 197. Time, 6 minutes. Half of the class should finish correctly 6 or more examples.

Second Speed Test in Multiplication. Examples 17 to 24, page 206. Time, 4½ minutes. Half of the class should finish correctly 4 or more examples.

Third Speed Test in Multiplication. Examples 9 to 16, page 210. Time, 4½ minutes. Half of the class should finish correctly 4 or more examples.

Page 220

Applications. Problems in sewing.

Remarks. Problems of this sort are valuable, if the material upon which they are based is actually in the hands of the children or very easily within their comprehension. The teacher should lose no opportunity to coin into problems material upon which the children are working, if such material yields naturally to arithmetic treatment. If the girls are doing hand work, the teacher should use the opportunity to have examples based on this experience, and if the boys are engaged in any kind of manual or constructive work, get whatever arithmetic may be in it. On the other hand, such problems when merely based upon descriptions found in books are to be looked upon with apprehension. Frequently not many of the children in a class have any real information about the material to which they are supposed to be applying their arithmetic, and if so, they will have no vital interest in it.

Page 221

New Matter. Rule for finding the area of a rectangle in square inches and in square feet.

Remarks. The teacher should be careful not to drag in logical hair-splitting at this point. There has been much discussion as to whether 10 in. × 12 in. equals 120 square inches, or whether we should write, 10×12 sq. in. equals 120 sq. inches. It is not difficult for the child to understand that the area in square inches is found by multiplying the length in inches by the width in inches; and that the area in square feet is obtained by multiplying the length in feet by the width in feet. We may as well learn to understand the fundamental fact that not all of our formal written matter can ever be put into clear-cut, complete, logical form. There are idioms in arithmetic as well as in other subjects. The debate on this point has been just as vital as certain other debates, the ridiculousness of which has been suggested by another writer, by comparing them to serious discussions by dietitians as to whether meat or potatoes should be eaten first, or possibly both together.

Page 222

New Matter. The thermometer.

Supplementary Matter. Get as many problems as possible based on local data on temperature. The children should be requested to bring in facts about highest temperature and lowest temperature for a particular day and for a whole year. There is no great harm in trying to get material that cannot be picked up without some trouble. Material that is really worth while usually requires some time to collect, and the person who gives up because he cannot find what he wants in a few minutes has still to begin his real education.

Page 223

Applications. Miscellaneous problems.

Supplementary Matter. Make problems like problem 1 on this page, involving the locality of the school. Also make problems relating to your own school, like problem 2 on this page. Make other problems like number 6, using the dates of births or deaths of such men as Washington, Grant, or of individuals who may be particularly interesting in the particular neighborhood. A problem like No. 9 may easily be made on the attendance data of your own school. The making of such problems as these by the children themselves, will render very much clearer the problems that they read in the book. We must not forget that there is a considerable gap between the solution of a problem based on data which appear before our eyes, and another problem based on similar data, but far removed from us and existing only in the abstract, as described on the printed page. This gap needs to be bridged with patience, and it can be bridged most easily by making such supplementary local problems as are here suggested.

Pages 224 and 225

Applications. Miscellaneous problems.

Supplementary Matter. Play the game on page 91. Use problems 13 to 20 inclusive on page 210.

Page 226

Application. Miscellaneous problems.

Remarks. Sometime during the year there is likely to be good local material for problems like 1 and 2 on this page. Do not stress these problems at this point. Wait until the material is in the making locally, and then make problems or have the pupils make them. A committee of children may be appointed to collect the necessary data.

Page 227

New Matter. Review and drill. Reading larger numbers.

Remarks. Note the suggestion that children learn to read numbers in other ways than in the conventional form. An expert computer always reads numbers in some such way as is mentioned on the first part of this page, and we all know how telephone numbers are read.

Page 228

Review and Drill Exercises in addition, subtraction, multiplication, and short division.

Supplementary Matter; Drill in Fundamentals. For the first event use examples 1 to 10 inclusive, on page 160. For the second event, use the first three rows of examples on page 212.

Page 229

New Matter. The tables of 11's and 12's.

Remarks. Many think it is not necessary to learn these tables, and the teacher may omit them if she thinks best. It is not very likely that even if these tables are learned they will ever be made use of in practical work. They are, of course, very easy to learn. The tables of 11's is practically known at once, and there are very few strange combinations in the table of 12. The best plan would probably be to learn these in a sort of an informal way without insisting on the inverse processes, such as is done in the case of other tables.

Page 230

New Matter. The number facts related to the combinations in the tables of 11's and 12's.

Page 231

New Matter. The form of long division.

Remarks. The purpose of this page is to learn the sequence of steps in long division. There is not the slightest danger that children will persist in using this long form for dividing by small number just because they use the small divisors here in order to make the form easy. We should note that the only new element in long division is the **form** in which the work is written down. The steps are exactly the same as in short division.

Pages 232 and 233

New Matter. The enumeration of the steps in long division.

Remarks. The last three lines in italics should be noted with care, and the facts embodied in them should be pointed out to the child in his work as he proceeds. The child will by no means be able to read page 232 understandingly at first. But as he learns the process of division this page will serve as a verbal summary. The purpose of pages 232 and 233 is to make clear the successive steps in the division process and to get the child accustomed to the form of the work. A constant comparison should be made with short division to make it clear that the processes in the two are exactly the same, the only difference being that in long division more of the work is written down. Note that in all these examples the divisors are of a very simple kind, and that there are exactly two figures in each quotient. The child should test every result in the manner indicated on page 233.

Page 234

New Matter. The estimating of quotient figures.

Remarks. The process of estimating quotient figures is the most difficult step in long division. Note the device for taking the quotient of tens when two-figure divisors are used in case the figure in ones' place is small, or in case this figure is nearly 10. The child should be able to understand why, with a divisor like 91, this method sometimes gives a quotient figure one too large, and with a divisor like 88 it sometimes gives a quotient figure one too small. If the child gets his eyes opened to this now he will have less difficulty with the more troublesome cases in which the divisors are such numbers as 76 or 84.

Note that at the bottom of the page separate work is given in estimating the quotient figures. The purpose is to isolate the most difficult step in long division and to permit the child to face that without any other complications.

Page 235

Review and Drill. Examples in long division.

Remarks. Note that the divisors given on this page are all of the type 49, 58, and so on. The simplest type, namely 31, 42, etc., was given on page 233. There are some examples on this page that give three figures in the quotient, but they will cause no serious trouble. In cases of three-figure quotients, the first figure is very easily found in these examples.

Pages 236 and 237

New Matter. Divisors of the type 76 and 84.

Remarks. These divisors are much more difficult than those of the type 89 and 91. No single rule will enable the child to get the quotient figure in all cases. The best that can be done is to acquire skill and insight by practice. Such practice is given at the bottom of page 236. Too much stress cannot be put on this one single difficult step, and the children should be given as much practice in it as may be convenient. If thought best, the teacher may add other examples of this sort.

After some skill in estimating quotient figures correctly has been acquired, the examples on page 237 may be worked.

Page 238

New Matter. Problems in division with zeros in the dividend and in the quotient.

Remarks. The two elements introduced on this page are not difficult, but it is best to delay them until the process of division is well in hand, and then to introduce them separately. When a new process is being learned, a single additional difficulty, even though slight in itself, may cause any amount of trouble. Now when the greatest difficulties involved in division are out of the way, these will cause little trouble.

Page 239

New Matter. Examples in division with zeros in the first places from the right in the divisor.

Remarks. The method of solving examples of this sort shown on this page is very useful and contains no essential difficulty. About all that is needed is the pointing out of the method and the solving of enough examples by means of it to illustrate this form of division. The children should be careful to get the correct remainders.

Pages 240 and 241

New Matter. Speeds and distances.

Remarks. The ideas of speed, time, and distance, and their fundamental relations, should be developed carefully. The exercises on page 240 should serve well for this purpose. However, the difficulty of the whole matter is in example 10 at the bottom of page 240, where the child is asked to state the general rules. If he is able to do this, the problems involving speed, time, and distance, will cause him little trouble.

Drill in Fundamentals. Play the game on page 91. Use examples 1 to 10 inclusive on page 235.

Pages 242 and 243

Applications. The areas of rectangles. Figures drawn to scale representing them.

Remarks. In case the school is in the country, these two pages may well be omitted altogether. If in the city, especially a large city where there are many apartment buildings, the problems on page 242 should be of real interest.

Supplementary Matter. By taking time to collect the material, the suggestions in problem 5 on page 242, and problem 9 on page 243, may be worked out in terms of local conditions. Interesting work may be done in estimating the number of people in certain blocks in different parts of the town. In one block there will be two-story flat buildings, in another three-story, in another four-story, and in another possibly ten-story flat buildings.

Pages 244 and 245

New Matter. The acre.

Remarks. If the school is in the city these two pages may possibly be omitted. However, every city child ought to know something about the area of an acre. There is so much information given in which the word acre is used, that every city person ought to have some conception of the meaning of an acre, and possibly be able to find the dimensions of a city block, and thus be able to compute the number of acres in a given territory.

Supplementary Matter. For the drill in fundamentals on page 244, use examples 11 to 20 inclusive on page 235.

Page 246

Review and Drill. Problems without numbers.

Remarks. It has been said often enough that arithmetic can be divided into two parts, one of which consists of the four fundamental operations, and the other of the application of these operations. This page has to do solely with the applications. If the child answers questions of this sort readily, it will indicate that he knows how to apply arithmetic to problems. That is, he has mastered the second part of arithmetic so far as he has gone. See notes to page 177.

There is an interesting class of children with deliberate minds who do not perform the fundamental operations rapidly for whom the applications have little trouble. These may be possessed of a very high type of mentality, and their advancement should not be delayed.

Page 247

New Matter. An introduction to the measure of volume or cubical contents.

Supplementary Matter. If the basement for a new home is being dug in the neighborhood of the school, the children should be encouraged to obtain information about its dimensions, and then to compute the cubical contents in cubic yards or in cubic feet, as the case may be.

Drill in Fundamentals. Run a field meet as described on page 195. For the first event work problems in subtraction, numbers 1 to 20 on page 192. For the second event, work the problems in division, Nos. 1 to 10 inclusive on page 237.

Pages 248 and 249

Applications. Problems involving the cubic foot, the cubic yard, the cubic inch, and the volumes of rectangular solids in terms of cubic units.

Remarks. There should not be any elaborate explanation on this topic. The child should be made to see how a layer of cubes may be placed in the bottom of a rectangular box and how many cubes this layer will contain. Then he should be led to see how many such layers are required to fill the box. Hence the idea of multiplying width by length by depth to find volume will arise directly and simply. Do not complicate matters by too many hair-splitting discussions. See notes to page 221.

Pages 250 and 251

Applications. The cutting, transporting, and selling of ice.

Remarks. It will be easy to get the children to understand why a very large amount of ice must be cut and put up during each winter. The children should also be told that nowadays a great deal of ice is made by machinery. The character of the machinery that makes the ice, and the principles involved, will be too difficult to be understood as yet.

Drill in Fundamentals. Play game suggested on page 91. Use exercises 11 to 20 inclusive, on page 237.

Pages 252 and 253

New Matter. Examples in long division, using three-figure divisors.

Remarks. The same method of attack is used here as in division with two-figure numbers, namely, the problem of estimating the quotient figures is isolated for separate study. Note again the division in example 2 on page 253, where the divisor has two zeros in the first places to the right. Divisors containing more than three figures other than the zeros to the right occur seldom and will not be studied here.

Pages 254 and 255

Applications. The tables indicating the proper weight of boys and girls at different ages.

Remarks.. The children should be taught to read these tables so they can gain information from them as to how much each one should weigh.

Supplementary Matter. For a drill in fundamentals play the game on page 91. Use the problems 1 to 8 on page 218.

Page 256

Review and Drill. Multiplication and long division.

Drill in Fundamentals. For the first game, find the products in examples 1 to 10 on page 219. For the second game, work examples 1 to 10 in long division on page 238.

Page 257

Review and Drill. The hour, the minute, the second. The reading of the clock, and other matters pertaining to the time of day, etc.

Supplementary Matter. At about this point, the tests in speed and accuracy suggested in the notes to page 219 should be repeated. To these tests add three on long division. Take examples as indicated here:

For the first test in long division use examples 1 to 8 inclusive on page 237. Time, 6 minutes.

For the second test in long division, use examples 1 to 8 inclusive on page 238. Time, 6 minutes.

For the third test in long division, use examples 1 to 8 inclusive on page 253. Time, 8 minutes.

In comparing the results obtained in these tests with the results obtained in the early part of the year, the progress of the children will become evident. It is of course known that in the fall children work more slowly than they do in the later part of the year; hence the results of these tests should now be very distinctly higher than the first time they were used.

Pages 258 and 259

New Matter. Fractions of a unit.

Remarks. Heretofore fractions of groups of things have been taken, and also fractions of abstract numbers, where these fractions themselves were whole numbers. We now turn our attention to the consideration of fractions of an integer. The essential point developed on these two pages is, that both terms of a fraction may be multiplied by the same number without changing its value; that is, $\frac{1}{2}$ is equal to $\frac{2}{4}$, $\frac{1}{4}$ is equal to $\frac{2}{8}$, $\frac{1}{3}$ is equal to $\frac{2}{6}$, and so on. It is not suggested that the rule should be stated as given above at this point. but the substance of it will be developed in the mind of the child as he works through the material given on these pages.

Pages 260 and 261

New Matter. The terms of a fraction. Fractions in the simplest form.

Remarks. One of the purposes of introducing fractions is to enable us to carry out completely the division problem as indicated in the example solved on page 261. It is brought out on page 260 that both terms of a fraction may be divided by the same number without changing its value. This step is necessary in reducing to the simplest form results such as obtained in example 2 on page 261. For the game on page 261, use examples 21 to 30, page 237.

Pages 262 and 263

New Matter. Addition, subtraction, and multiplication of very simple fractions.

Remarks. Note the sequence of difficulties as they are introduced. First add $\frac{1}{3}$ and $\frac{1}{3}$. This surely will cause no trouble. Second, add $\frac{1}{2}$ and $\frac{1}{4}$. This requires that $\frac{1}{2}$ be reduced to fourths, which can now be readily done. Notice that in the exercises in addition, in each exercise one fraction is reduced to the same denominator as that of the other fraction.

Similar remarks apply to the examples in subtraction of fractions.

On page 263 there are two groups of examples involving multiplication of fractions by a whole number. In the first group no cancellation is possible, and the work must be carried by multiplying the numerator by the integer. In the second group, cancellation is possible, and the work may be done by multiplying first and then reducing the fraction to its simplest form.

These two pages contain all the operations needed for multiplying and subtracting fractions that are given in this book.

Supplementary Matter. Drill in Fundamentals. Play the game on page 195. For the first event, use examples 17 to 24, on page 206.

For the second event, use the examples 1 to 10, page 238.

For the third event, use examples 10 to 17, on page 253.

Page 264

Applications. Problems on raising poultry.

Remarks. If there is anyone in the class who is engaged in poultry raising, get him to collect data for problems similar to these. It would be a waste of time, however, to endeavor to get data if no one in the class is having actual experience with this sort of work.

Page 265

Review. Problems without numbers.

Remarks. Read again the note to page 246.

Page 266

Applications. The cost of using the United States mail.

Remarks. In every locality it will be easy to find material for making other problems of this sort. The importance of making problems based on local data lies in this, that the child gets a thoroughgoing understanding of the fact that arithmetic is grounded directly upon the livesof the people that are now living in the neighborhood. That is the one way that arithmetic can be made really practical to the child.

Page 267

Review and Drill. Addition, multiplication, division.

Page 268

Applications. The selling of newspapers.

Supplementary Matter. If the school is in the city there is very likely to be some boy in the class who is actually engaged in selling newspapers. Get him to bring in actual data arising from his personal business, and then let the members of the class make other problems, using these data.

Page 269

Applications. The making out of sales checks.

Supplementary Matter; Drill in Fundamentals. For the first event use examples 1 to 12 on page 197. For the second event, use examples 19 to 25 inclusive on page 253.

Page 270

Applications. The meat market.

Remarks. The problems on this page are very practical. Give the children some additional drill in finding the actual prices of a given number of pounds and ounces of various kinds of meat. Note that the prices given here are not the extravagant prices that developed during the war. They are nearer the general level of prices which have obtained in this country over a long period.

Page 271

Applications. Discount and net price.

Remarks. The words "net price" are used here for the first time, but will cause no difficulty. Do not here connect the word "discount" with work in percentage. Discounts are frequently given in terms of ordinary fractions, and the problems given here can readily be solved.

Pages 272 and 273

Applications. Measuring and folding paper.

Remarks. The real purpose of these pages is, of course, to get the children to measure accurately and to make such computations as are needed in practical work. By actually folding the paper which he had measured and endeavoring to get the pieces to fit together, the child will have the very best test of the accuracy of his work; indeed this is precisely the test to which every measurement is put in practice. If a stone is to be measured so as to fit into a certain place in the wall, the test of the measurement is that the stone fits into its place. This applies in a great many practical cases. The pages should be worked out thoroughly, and if the work is done in the right way the children will take real interest in it.

Pages 274 and 275

Application. The cost of a school building with its furniture and supplies, and the cost of the running of the school.

Remarks. Many problems similar to those on these pages can be made from local material, and the material itself should not be hard to obtain. No doubt some school official is willing to furnish an inventory of the furniture and supplies in the schools for a certain year. This inventory will be excellent material for the making of real problems.

Again, school officers will be glad to furnish an account of the cost of running a school, including the cost of the various items. Such material will form a very good basis for interesting problems.

Page 276

Applications. The building of a sidewalk.

Remarks. The data given here were obtained from an actual case in a small New York town, before the war raised prices out of the ordinary level. It will be easy to obtain data on the cost of a sidewalk in the town where the school is located. It will likely be found that the sidewalk will be about twice as expensive per square yard as the cost given here. However, the principle is the same, so far as the arithmetic is concerned, whether the figures used are high or low.

Drill in Fundamentals. For the first event in the game suggested at the bottom of this page, use example 1 to 8, page 210. For the second event, use examples 9 to 23 inclusive on page 218. For the third event, use examples 1 to 10 on page 256. For the fourth event, use examples 1 to 10 on page 238.

Page 277

Review and Drill. Problems without numbers.

Remarks. See note to page 246.

Page 278

Applications. Miscellaneous problems.

Pages 279 and 280

New Matter. Tables that have been learned thus far in arithmetic.

Remarks. The multiplication tables have not been collected in one place anywhere in the book. This is done now so that they may be had for reference. The theory has been throughout that the combinations of the multiplication tables should be learned individually and separately, without reference to a table. Similar remarks apply to the tables given on page 280. Both these pages may be used for drills in the manner suggested at the bottom of page 279.

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